TROPICAL DISEASES BUREAU.

TROPICAL VETERINARY BULLETIN.

VOL. 10.] 1922. [No. 3.

DISEASES DUE TO PROTOZOAN PARASITES.

GLASER (R. W.). **A Study of** *Trypanosoma americanum.*—*Jl. Parasit.* 1922. Mar. Vol. 8. No. 3. pp. 136–144. With 4 plates.

The author has been led to restudy *T. americanum* as a considerable amount of work has been done on trypanosomes and allied genera since the publication of CRAWLEY's article in 1912. During October, November and December, 1921, the author examined a number of cows and heifers by the cultural method, using CRAWLEY's technique (*i.e.*, 6 cc. of defibrinated blood from the animal to be tested with 6 cc. of broth on the top, the tubes incubated at room temperature). Between October 15 and November 8 positive results were obtained with the blood of 7 animals out of 15 tested. Thirteen samples of blood from different animals taken between November 12 and December 10 all yielded negative results.

Very satisfactory results were obtained with N.N.N. medium prepared with either cow or horse blood. In this medium multiplication is very rapid during the first four or five days. The method is therefore useful for studying dividing forms. A necessary precaution is to moisten the surface of the medium with sterile serum every few days, or to keep the cultures (made in Petri dishes) in a moist atmosphere. On this medium growth is diffuse and not in the form of colonies. The technique of fixing and staining preparations most extensively used was wet fixation in alcohol and ether in equal parts for 15 minutes, followed by staining with NOVY's modification of Romanowsky. Certain details were best studied by using SCHAUDINN's fixative, followed by iron haematoxylin.

Cultures are best studied after three days at room temperature. In these the parasites are found to have nearly cylindrical but curved bodies. The undulating membrane is visible for only about one-third of the body length at the anterior end. The flagellum is as long as or longer than the body. There is a parabasal body near the posterior end of the flagellum, but no blepharoplast is visible. The nucleus is central or anterior to the central point of the body. There is usually a distinct karyosome. The body may contain many deeply stained granules. In some cases no nucleus could be found with certainty in films containing numerous well-stained specimens. By the eighth day nearly all the parasites have lost their undulating membranes, the body appears to be rigid and the nucleus anteriorly placed. A fourteen-day culture in ox blood shews bulbous forms, and round or oval forms, these latter without any flagellum.

(6965) Wt. P4/116 700 8/22 Harrow G.75/5 F

After 20 days cultures begin to die off. As already mentioned, multiplication is more rapid on solid media, and the life of the parasites is correspondingly shortened. Degeneration forms are marked by the ninth day. Although amoeboid-looking forms are seen, no actual amoeboid movement has been observed. Experimental inoculations with guinea-pigs, rabbits and mice confirmed CRAWLEY's observation that the trypanosome is specific for cattle.

The insects found in the largest numbers around the cattle were *Stomoxys calcitrans*, *Haematobia serrata* and *Musca domestica*. A large number of specimens of each of these species was examined for trypanosomes, but with entirely negative results. *Herpetomonas muscae-domesticae* was frequently found in the house-flies.

Experimental feeding of Stomoxys and Haematobia showed that the trypanosome was still alive, but considerably modified after 24 hours. After 48 hours the existence of the flagellate was doubtful.

In view of NÖLLER's recent contention that the genus Crithidia is a synonym for Trypanosoma, experiments were carried out with a view to testing whether true trypanosomes could be obtained in the cultures from the crithidial forms by subjecting the plates to changes of temperature as indicated by NÖLLER. No true trypanosome forms were obtained. The author has never seen the parasite in true trypanosome form. A specimen found by examination of sediment of centrifuged blood containing the parasite was morphologically like those obtained in cultures.

Although the parasite is morphologically a Crithidia, the author prefers not to alter its designation as a trypanosome for the reasons that: (1) The true Crithidia inhabit the alimentary tract of invertebrates; (2) since the parasite occurs in the blood of cattle it seems best to regard it as an intermediate evolutionary form between the true crithidians and true trypanosomes; (3) the parasite has remained in the genus Trypanosoma for so long.

TALIAFERRO (W. H.) & TALIAFERRO (L. G.). **The Resistance of Different Hosts to Experimental Trypanosome Infections, with Especial Reference to a New Method of measuring this Resistance.**—*Amer. Jl. Hyg.* 1922. May. Vol. 2. No. 3. pp. 264–319.

The authors point out that there are four types of life-histories of trypanosomes in vertebrate hosts: (1) Non-pathogenic trypanosomes, such as *T. lewisi* in the rat. This trypanosome undergoes multiplication in the rat's blood for a period of 22 to 32 days. Multiplication then ceases, but trypanosomes remain very plentiful in the blood for a further period ranging from 7 to 100 days. After this the so-called adult forms disappear and the rat is immune. (2) Pathogenic African trypanosomes, such as *T. brucei* and *T. rhodesiense*, when grown in rats and mice exhibit a continuous type of infection, multiplication going on until the host dies. (3) The same trypanosomes when inoculated into guinea-pigs, dogs, etc., exhibit a relapsing type of infection, characterized by alternating periods of increase and decrease of parasites in the blood. (4) There is at least one species of trypanosome which does not reproduce in the blood at all, but in the tissues (*T. cruzi*).

These differences may be explained by assuming a peculiar type of constitution either in the parasite or the host. The life-history of *T. cruzi* is probably explained by the first assumption, the trypanosome being in reality a tissue parasite. In the other cases the underlying cause appears to be a condition (permanent or temporary) of the host.

BRITISH MUSEUM

The authors consider any of the conditions which are adverse to the parasite as "resistance," whether it be direct, as a result of special activity on the part of the host, or in any manner indirect. *T. cruzi* is not considered in this paper.

Any resistance to infection may result either in retarding multiplication or in destruction of the forms produced. A fairly accurate idea of the total resistance may be obtained by making daily estimations of the number of trypanosomes present per cc. If, however, means could be devised by which a measure of the rate of multiplication or the rate of destruction could be determined, the two types of resistance could be differentiated. The authors have attempted to devise means of determining comparatively the rate of multiplication, based upon the difference in variability in size of individuals taken from a population of trypanosomes undergoing rapid multiplication and from a population undergoing little or no multiplication.

The authors have adopted the method of obtaining a coefficient of variation which measures the deviation in percentages from the mean, and have used the coefficient of variation for the total length.

Working on these lines they found that in rats infected with *T. lewisi* the arrest of multiplication and the later disappearance of trypanosomes are due to a resistance, the essence of which is a retardation of multiplication. Just as their resistance is reaching its maximum, the host suddenly develops a resistance which kills off most of the parasites in the blood. Those which remain persist for a variable length of time and are finally killed off suddenly.

In mice and rats infected with pathogenic trypanosomes the opposite condition is found to hold. No evidence of resistance on the part of the host leading to retardation of multiplication can be found. In some instances multiplication became more rapid as the infection progressed.

In the relapsing type of infection, such as that produced by pathogenic trypanosomes in dogs, no evidence could be found of a resistance being developed by the host resulting in a retardation of multiplication, but a resistance is developed which destroys a large number of the parasites after they are formed. "The fact that resistance in the non-pathogenic *T. lewisi* produces two different effects, whereas resistance in pathogenic species (if present at all) produces only one of these effects, indicates that in the non-pathogenic forms there is either an entirely different type of mechanism of resistance, or that there is a different type of mechanism superimposed on the mechanism found in the pathogenic forms. It is interesting to note that Miss ROBERTSON (1912) has brought forward considerable evidence to show that in *T. gambiense* in the monkey there is an endogenous cycle, in which phases of active reproduction alternate with phases of little or no reproduction. If this be true, it would indicate that this form in the monkey encounters much the same type of resistance as *T. lewisi* in the rat, except that in the latter case when reproduction ceases it never starts again. Miss ROBERTSON's results indicate that *T. gambiense* in the monkey encounters a resistance midway between the type we have described in *T. lewisi* in the rat and the pathogenic species in the guinea-pig. Such a result would not be at all surprising, and with the growing evidence that *T. gambiense* can exist in certain mammals as a non-pathogenic parasite it may be possible to find a host in which this trypanosome encounters the same type of resistance as *T. lewisi* in the rat."

DAHMEN (H.). **Die Serodiagnostik der Beschälseuche.** [The Serum Diagnosis of Dourine.]—*Arch. f. Wissen. u. Prakt. Tierheilk.* 1922. Mar. Vol. 47. No. 5. pp. 319–353.

The author has employed the following methods in the serum diagnosis of dourine:—deviation of the complement using watery and alcoholic extracts as antigen, agglomeration, macroscopic agglutination, precipitation, and lipoid fixation reaction. The paper also contains accounts of experimental treatments with various drugs.

It was found that alcoholic extracts were superior to watery extracts as antigen. The trypanosomes used for making the extracts were obtained by bleeding out rats infected with *T. equiperdum* shortly before death.

The strain of *T. equiperdum* used was apparently one isolated during an outbreak of dourine in Prussia. In a comparative set of tests the alcoholic (alcohol-aether) extract appeared to be about six times as effective as the watery (carbolized salt solution) extract.

In a not inconsiderable number of cases the results appeared to indicate that when plaques appeared the amount of antibody present in the serum decreased. A persistent reduction in the amount of antibody associated with the appearance of fresh clinical symptoms appeared to indicate a bad prognosis.

Repeated injections of trypanosome extracts or rat blood containing trypanosomes into rabbits was found to cause distinct variations in the antibody content of the rabbits' serum.

The specific nature of the complement deviation obtained with dourine horses was tested by carrying out tests with sera from a number of horses affected with glanders, epizootic lymphangitis, infectious anaemia and strangles, horses immunized against swine erysipelas, and a number which gave positive serum tests for equine contagious abortion. In no case was a positive result obtained.

With a view to ascertaining whether the antibodies present in dourine sera would react with other extracts, a number of experiments were carried out in which the following were used: extracts of hearts and spleens of rats dead of dourine, hearts of healthy rats, various extracts of hearts with and without cholesterin, extracts of glanders bacilli, paratyphoid bacilli, colon bacilli, and Bang's bacillus.

In all cases negative results were obtained, save in those in which the organs of infected rats provided the antigen.

A few agglomeration tests showed that positive sera give agglomeration within five minutes. Agglomeration requiring a longer time is not specific. No details of the technique employed for this test are given.

Owing to the spontaneous clumping of trypanosomes the author did not proceed with the macroscopic agglutination test.

The precipitin test was found to be far inferior to the deviation of the complement test. In four sets of experiments the percentage of dourine sera failing to give positive reactions ranged from 10 to 27 per cent.

The Sachs-Georgi reaction entirely failed to distinguish dourine sera from any others. Lipoid fixation is more reliable than complement deviation, but it is most important that the sera must be rendered absolutely clear by centrifugation. The lipoid fixation reaction does not vary as does the deviation of the complement test; it is also far more accurate in cases which have been under treatment.

Treatment was carried out with neosalvarsan, silversalvarsan, Bayer "205," and neosilversalvarsan. Neosalvarsan was given in doses of 12 gm., and two doses were given at an interval of 8 days. Good results were obtained in six cases.

Silversalvarsan is likely to cause abortion in pregnant mares, and in some animals trembling of the back and limbs may be observed after an hour or two. Twelve animals were treated with this drug, 10 gm. being given in doses of 4, 2 and 4 gm. at intervals of 8 days. Excellent results were obtained.

Bayer "205."—Five horses received a total of 15 gm. in doses of 4, 4, 4 and 3 gm., and five were given 20 gm. in doses of 4, 4, 4, 3, 3 and 2 gm.

The results were apparently as good as those obtained with the above drugs, but the animals treated with Bayer "205" were not able to work so well as those treated with salvarsan and became fatigued more rapidly.

The results obtained with silversalvarsan will be reported later.

Twelve foals of dourine-infected mares were tested (method not stated), and two gave positive results. At three months old these failed to react and they never showed any symptoms.

SANI (L.). **Il Morbo Coitale Maligno in Italia ed i diversi metodi di diagnosi sperimentale.** [Dourine in Italy and the Various Methods employed for Diagnosis.]—*Clin. Vet.* 1922. Feb. 16 & 28. Vol. 45. No. 3. pp. 87–94; Mar. No. 4. pp. 121–145.

The author has found the following tests to be useless: The biological test (animal inoculation), thermoprecipitin, aspecific precipitation, Yorke's reaction, the protective properties of the serum against other trypanosomes, Wassermann reaction, injection of adrenalin, the examination of the urine for sugar.

The following methods have a positive value: The discovery of the parasite, precipitation, Lange's reaction, deviation of the complement where that is positive. The question as to which of the serological tests is the more important is still doubtful. The autohaemagglutination test, the intra-palpebral and the subcutaneous vulvo-reaction (with reservations regarding the antigen content of the material used) have a relative value.

VAN SACEGHEM (R.). **Le pouvoir attachant du** *Trypanosoma congolense-pecorum* **variété** *ruandae*, **pour les hématies.** [The Power of attaching itself to Blood Corpuscles possessed by *T. congolense-pecorum* var. *ruandae*.]—*Bull. Soc. Path. Exot.* 1922. Apr. Vol. 15. No. 4. pp. 203–204.

In moist preparations of blood containing this trypanosome it is remarkable that a large number of the parasites are found attached to the red corpuscles by their anterior extremity, and that they are unable, or scarcely able, to detach themselves. When fresh defibrinated blood containing the trypanosome is placed in simplified Novy medium, it is found that after a lapse of 24 hours the parasites are quite free from the corpuscles and move about freely among them. The author believes that this is due to the trypanosomes having lost the power of attaching themselves to the corpuscles, and not that the corpuscles have lost the power of keeping the parasites attached to them.

The loss of power is associated with the appearance of evidence of degeneration in the parasites.

After several days in Novy medium the trypanosomes become agglutinated.

The author thinks that while *T. cazalboui* var. *vivax*, a very actively motile trypanosome, does not become attached to corpuscles, the trypanosome specially referred to in this paper, the motility of which is very restricted, attached itself to the corpuscles in order to be carried rapidly to all parts of the body.

CARPANO (M.). **Sulla piroplasmosi equina in Italia.** [Equine Piroplasmosis in Italy.]—*Clin. Vet.* 1922. Apr. Vol. 45. No. 5. pp. 187–203.

The author has carried out some experiments with blood containing *Nuttallia equi* and *Babesia caballi* either separately or together. He finds that while the blood of a horse which is actually suffering or has recovered from nuttalliosis is infective for a susceptible animal and non-infective for one immune to that infection, the blood of an animal which has recovered from a Babesia infection is not infective for a susceptible horse.

Parallel results were obtained when blood containing both parasites and when blood from an animal which had recovered from the double infection was used for inoculation.

Rhipicephalus bursa, which is the transmitting tick of Nuttallia, is a two-host tick. The infection is gathered by the larva or nymph and transmitted by the adult.

Margaropus annulatus, which is responsible for the transmission of Babesia, is a single host tick. The infection in this case is passed through the egg.

LAGRANGE (E.). **Contribution à l'étude des piroplasmes des bovidés.** [The Bovine Piroplasmoses.]—*Bull. Soc. Path. Exot.* 1922. May. Vol. 15. No. 5. pp. 295–299.

At Nha-Trang, in Indo-China, *Theileria mutans*, *Piroplasma bigeminum* and *Anaplasma marginale* occur in cattle, the first very abundantly and the last two but rarely.

The buffalo is fairly frequently affected with *Theileria*, or better *Gonderia*, *mutans*, and a single case of piroplasmosis, due to a parasite of the *bigeminum* type has been detected by SCHEIN. An account of this has already been published.

In an experiment carried out by the author he succeeded in transmitting *T. mutans* from a buffalo to a number of calves, and he concludes that the parasites of the two species are identical.

The author inoculated three young buffaloes with blood containing parasites both of the *Piroplasma bigeminum* and of the *Anaplasma marginale* types, but without result. In a single experiment in which blood containing *P. bubali* was inoculated into a calf the result was negative.

Cattle in Annam are very extensively parasitized by *Boophilus decoloratus*. Other species of ticks are not found in them. The author has never been able to find any ticks on buffaloes.

Wild deer act as hosts to ticks belonging to Haemaphysalis, and are sometimes literally covered with them.

BLACKLOCK (B.) & ADLER (S.). **A Parasite resembling** *Plasmodium falciparum* **in a Chimpanzee.**—*Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 99–104. With 1 plate.

The animal in which the parasite was found was an *Anthropopithecus troglodytes* which had had some attacks of diarrhoea and dysentery previously. The illness was first noted on January 1, and the malarial parasites were found on February 4, 1922. Symptoms of ill-health increased, and this was associated with an increase in the number of parasites in the blood. On February 9 a dose of quinine was given, which resulted in a diminution of parasites in the blood, but did not effect a complete clearance. Improvement in condition resulted, but there was a relapse on the 19th. After a short period of recovery the animal died on the 23rd.

The immediate cause of death appeared to be the presence of very large numbers of strongyloid larvae in the lungs. The spleen was not greatly enlarged, but it was dark in colour and harder than normal. The liver was congested, the marrow dark in colour.

Trophozoites and schizonts were found in the spleen together with masses of pigment. There was considerable fibrosis.

The liver contained large quantities of pigment. The bone marrow shewed trophozoites and gametocytes, and coarse pigment.

The same phases were present, but not in large numbers in the blood. Heavily pigmented leucocytes were common.

Morphologically, the parasite was indistinguishable from *P. falciparum*.

Laboratory-bred specimens of *Anopheles costalis* were allowed to feed on the chimpanzee for two successive nights, but when these were dissected no evidence of infection was found. Two human beings inoculated subcutaneously and intravenously with the chimpanzee's blood, when parasites were present in large numbers, failed to become infected. One of these had not had malaria.

GLASER (R. W.). *Herpetomonas muscae-domesticae*, **its Behaviour and Effect in Laboratory Animals.**—*Jl. Parasit.* 1922. Mar. Vol. 8. No. 3. pp. 99–108. With 1 plate.

While making some observations on the habits of blood-sucking flies at a large dairy the author observed that many of the house-flies frequenting the cattle were engorged with blood. Examination showed that the blood was obtained from cows, and it was noted that the flies fed at punctures made by *Stomoxys calcitrans* or *Haematobia serrata*. These observations indicated that house-flies might act as transmitting agents of parasites.

Since no protozoa were found in the biting flies the opportunity offered to examine the protozoa of the alimentary tract of the house-flies.

Three species of flagellates were found, and one of these forms the subject of this paper.

Herpetomonas muscae-domesticae Burnett was by far the most prevalent, and when present was almost always in enormous numbers. In making numerical estimations only those showing the true flagellate form were counted so that errors of possible confusion with other parasites might be avoided.

During the period June to November, a total of 510 flies were dissected. The number parasitized rose from 12·5 per cent. in June

to 52 per cent. in August, and fell to 4 per cent. in October. In November, none was found to contain parasites out of 50 examined.

The author was unable to find parasitized flies among those caught in dwellings, but only in those having access to cattle.

From an examination of his preparations the author forms the opinion that the parasite possesses a single flagellum, thus agreeing with LÉGER, PATTON, PORTER, MACKINNON, and WENYON. A deeply staining thread was observed in some individuals running backwards from the kinetonucleus, but the spiral arrangement of this thread described by PROWAZEK could not be made out. Similarly, the cytopharynx described by WENYON was not observed. In no case was a bacterium found within the endoplasm.

The author believes that the Herpetomonas found by him in New Jersey is identical with or closely allied to the species occurring in Europe.

In contrast with the positive results obtained by a number of investigators in Europe and elsewhere, the author failed to infect mice, rats and guinea-pigs with the intestinal contents of heavily parasitized flies.

The author succeeded in obtaining cultures of the herpetomonad by the following procedure. About 200 larvae of the meal moth (*Euphestia küniella*) were rubbed up in a mortar with 25 cc. of sterile Locke's solution. This was filtered through cloth, paper and a Berkefeld filter. The filtrate was mixed with filtered fresh horse serum in the proportion of 1 to 3. The mixture was tubed in small tubes and inspissated at 74° C. Two drops of grasshopper blood were allowed to flow over the surface of each slant, and the tubes were incubated for 48 hours to test for sterility.

Fifteen grasshoppers and two locustids were inoculated with materials prepared from the intestines of heavily parasitized flies, while 15 grasshoppers were kept as controls. In 48 hours practically all the controls were alive and all but one of the inoculated hoppers were dead. The two locustids were alive. Herpetomonads were found in the blood of all three. Tubes of the special medium described above were inoculated from each of the survivors and kept (sealed with wax) at room temperature for seven days. Growth of Herpetomonas was obtained in a number of the tubes and all were sterile for bacteria. The growth was composed of flagellates in dense clumps. The parasites were actively motile in Locke's solution, but their flagella were abnormally long and appeared to hamper them. Otherwise, their morphology was identical with that of the parasites in the flies.

Subcultures on the same medium failed at the second generation.

Two mice were inoculated intraperitoneally with primary cultures, but no infection occurred. The idea of using grasshopper blood originated in the known immunity which may be developed in grasshoppers against bacteria, and it was hoped that in this way the bacteria present in the intestines of the flies could be killed off.

MENDELSON (Ralph W.). *Pseudo-Leptospira icterohaemorrhagiae.*—*Jl. Trop. Med. & Hyg.* 1922. May 15. Vol. 25. No. 10. pp. 125–126. With 2 figs.

Although the author has never observed a case of Weil's disease in Siam, he has during the last year examined the kidneys of 1,483 rats, and has found an organism closely resembling *L. icterohaemorrhagiae* in eight of them. Cultures have not been obtained. In smears from

the kidney the organism ranges from 5 to 30μ in length and has from one to six curves. No refractile granules have been noted.

A monkey and seven guinea-pigs failed to react to inoculation, although in one of the latter the presence of a similar organism was demonstrated.

The author thinks that the parasite is harmless.

CAUCHEMEZ (L.). **Au sujet du nom spécifique à donner à la Coccidie du Porc.** [The Specific Name of Coccidium of the Pig.]—*Bull. Soc. Path. Exot.* 1922. Mar. Vol. 15. No. 3. pp. 160–161.

The author writes that in Vol. 14, No. 10, of the *Bulletin* he proposed the name *Eimeria brumpti* for this parasite, and he now writes to say that that name should not stand for the following reasons :—

NÖLLER described the parasite as *Eimeria suis* at Hamburg on December 7, 1920, but his description did not appear in print until February, 1921, when it was published in the *Archiv für Schiffs- und Tropen-Hygiene*, Vol. 25, No. 1, p. 32. In January, 1921, there appeared a thesis by DOUWES in which the name *Eimeria debliecki* was given to the organism (see below, p. 102.)

FLETCHER (T. B.) & SENIOR-WHITE (R.). **Surra and Biting Flies : A Review.**—*Report of Proc. Fourth Entomolog. Meeting, Pusa, India, Feb. 7th to 12th, 1921.* pp. 222–235.

FRANCHINI (G.). **Au Suject de la Culture de l'Herpetomonas du** *Pyrrhocoris apterus.* [The Cultivation of the Herpetomonas of *Pyrrhocoris apterus*.]—*Bull. Soc. Path. Exot.* 1922. Mar. Vol. 15. No. 3. p. 161–163. With 1 text fig.

PATTON (W. S.). **Some Reflections on the Kala Azar and Oriental Sore Problems.**—*Ind. Jl. Med. Res.* 1922. Jan. Vol. 9. No. 3. pp. 496–544.

TALIAFERRO (W. H.). **Variation and Inheritance in Size in** *Trypanosoma lewisi*. **I. Life-Cycle in the Rat and a Study of Size and Variation in "Pure Line" Infections. II. The Effects of Growing "Pure Lines" in Different Vertebrate and Invertebrate Hosts and a Study of Size and Variation in Infections occurring in Nature.**—*Proc. Nat. Acad. Sci. U.S.A.* 1921. May & June. Vol. 7. Nos. 5 & 6. pp. 138–143 & 163–168. With 2 figs.

TROUT (C. L.). **Treatment of Trypanosomiasis by Various Methods.**—*Jl. Trop. Med. & Hyg.* 1921. Dec. 15. Vol. 24. No. 24. pp. 321–322.

DISEASES DUE TO METAZOAN PARASITES.

KHALIL (M.). **On the Susceptibility of the Egg Masses of Planorbis to Drying, Chemical Fertilisers, etc., and its Bearing on the Control of Bilharzia Disease.**—*Jl. Trop. Med. & Hyg.* 1922. Mar. 15. Vol. 25. No. 6. pp. 67–69.

As the Egyptian snails were not obtainable, it was decided to experiment with *Planorbis corneus* (from the ponds at Hampstead). This snail is larger than *Planorbis boissyi*, but is similar in its habits.

The egg masses were exposed to drying in the shade at temperatures ranging from 62° to 72° F., and were also placed in solutions of chemical substances for definite periods.

The stage of development which the egg has attained does not influence the period for which it will resist desiccation. The minimum period of dryness found to be effective was five hours. In no case did this period fail to be fatal.

A 1 per 1,000 dilution of crude ammonium sulphate fertilizer proved invariably fatal in a minimum period of six hours. A solution of one-fifth of this strength was fatal in 20 hours.

The adult snails were killed by three days' dryness, and 24 hours' immersion in 1 per 1,000 ammonium sulphate fertilizer proved fatal.

CAWSTON (F. G.). **Bilharzia Infection in the Pool, the River, and the Lagoon.**—*Jl. Trop. Med. & Hyg.* 1922. Jan. 16. Vol. 25. No. 2. pp. 16–18.

In this short paper the author draws attention to the value of ducks in keeping pools free from freshwater snails, and states that copper sulphate in 1 in 500,000 strength destroys the majority of snails. In the lagoons of Natal many snails have been collected which have an operculum. This enables them to resist sudden changes of environment. *Tiara tuberculata*, a species similar to the intermediate host of *Schistosoma japonicum*, is operculated and can resist drought for several weeks.

BAKER (Frank Collins). **Fluke Infections and the Destruction of the Intermediate Host.**—*Jl. Parasit.* 1922. Mar. Vol. 8. No. 3. pp. 145–147.

In this article the author protests against the unrestricted use of sulphate of copper for the destruction of molluscs, because of its highly toxic properties for fish. The salt may be employed without harm to small bodies of water not directly connected with running streams or large lakes, but to eradicate molluscs from such streams or lakes by means of sulphate of copper would necessitate pollution to such an extent that practically all life would be destroyed.

i. MAPLESTONE (P. A.). **Notes on Australian Cestodes. III.** *Cotugnia oligorchis* **n. sp.**—*Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 55–60. With 6 text figs.

ii. —— & SOUTHWELL (T.). **Notes on Australian Cestodes. IV.** *Gyrocoelia australiensis* **Johnston.**—*Ibid.* pp. 61–68. With 7 text figs.

i. The author describes a parasite which has been found on four occasions in the intestine of the whistling duck (*Dendrocygna arcuata*, Cuvier) in North Queensland.

ii. The tapeworm described in this paper is a fairly common parasite. It was found in the intestines of several spur-winged plovers in North Queensland.

BAYLIS (H. A.). **Notes on some Parasitic Nematodes.**—*Ann. & Mag. Nat. Hist.* 1922. May. Vol. 9. pp. 494–504. With 8 figs.

The genera referred to in this paper are : (1) Wellcomia ; (2) Ascaris, and (3) Porrocaecum.

1. A new species of Wellcomia—*Wellcomia samboni* sp. n. from the intestine of the hairy porcupine (*Coendou couiy* Desm.), Paraguay.

2. *Ascaris dasypodina* sp. n. from an armadillo (*Cabassous unicinctus*), Paraguay.

3. Two species of Porrocaecum from birds, *P. semiteres* and *P. ensicaudatum*.

BOULENGER (C. L.). **On *Ascaris vitulorum* Goeze.**—*Parasit.* 1922. Apr. Vol. 14. No. 1. pp. 87–92. With 3 text figs.

The author has examined specimens of this parasite taken from the Indian buffalo and from Rhodesian cattle, and finds that they are identical. They appear, however, to differ in certain points from the Ascaris of European cattle, supposing the description of that parasite to be accurate.

He has not as yet had the opportunity of examining Ascarides of European origin.

ACKERT (J. E.) & PAYNE (F. K.). **A New Parasite of the Pig.**—*Jl. Amer. Vet. Med. Assoc.* 1922. May. Vol. 61. No. 2. pp. 186–188.

The parasite described in this note was found by the authors in native pigs in Trinidad while investigating the relationship of that animal to human hookworm disease.

The new species closely resembles *Necator americanus* in proportions and general appearance, but is smaller. Constant morphological differences between the two species also occur in the angles of the ventral plates, shapes of the lateral lancets, and lengths of the terminal branches of the dorsal bursal ray.

Characters of the genus *Necator* Stiles, 1903, are given, and the parasite found in the pig, which has been named *Necator suillus* Ackert & Payne, 1922, is described in some detail. The parasite would appear to be of economic importance, as both old and young pigs were found infested, and in some cases several hundred were present. Emaciation was very marked.

LAKE (G. C.). **Carbon Tetrachloride. A Drug proposed for the Removal of Hookworms, with Special Reference to its Toxicity for Monkeys when given by Stomach Tube in Repeated Doses.**—*Public Health Repts.* 1922. May 12. Vol. 37. No. 19. pp. 1123–1126.

The author's summary and conclusions are as follows :—

" 1. Four monkeys received carbon tetrachloride by stomach tube in amounts of 1, 2, 3 and 5 cc. respectively at intervals of 2 to 3 days, over a period of from 30 to 41 days, the total number of doses varying from 12 to 16.

" 2. No symptoms of importance were shown by the monkeys during this period.

" 3. The two monkeys receiving the larger doses were subsequently used for the testing of suspected poliomyelitis virus and died of brain abscess. In each case gross and microscopic examination of the important organs failed to show any changes indicative of an exogenous poisoning.

" 4. The doses received by the monkeys at each treatment were from 10 to 40 times greater in cubic centimetres per kilogram of body weight than the dose mentioned by HALL as that indicated for man, and these doses were repeated from 12 to 16 times.

" From the data at hand, we must conclude that carbon tetrachloride by stomach has a very low toxicity for monkeys, and it is probable that man may be given considerably higher doses than the ones suggested by HALL, and that it might be safe to repeat the dosage several times at proper intervals (one week).

"Finally, in view of the unusually promising results that carbon tetrachloride has given as an anthelmintic for hookworms in animals, and in view of its unusually low toxicity for animals, including monkeys, when given by stomach, both in single and in repeated doses, we believe that it deserves an extensive trial in the treatment of hookworm disease in man.

"NOTE.—HALL has just informed the writer that he and Dr. SHILLINGER have given dogs as high as 300 cc. as a single dose without causing evident toxic symptoms."

ALLEN (J. A.). **The Efficiency of Carbon Tetrachloride against Hookworms in the Silver Black Fox.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Apr. Vol. 61. No. 1. pp. 31–37.

Of 1,422 specimens—carcases and faeces—examined, 345 have been found to contain hookworms. On some ranches the percentage of infected animals reached 65.

Carbon tetrachloride has been tried for the expulsion of this parasite. The drug was given in gelatin capsules, and was followed by a small dose of castor oil. The animals were fasted for 12 to 14 hours prior to treatment. Three sets of experiments were carried out. In the first the dose recommended by HALL, 0·3 cc. per kilo, was used. In the second series double this dose was given. In the third the drug was given in a drench instead of in gelatin capsules, and no purgative was given before or after.

In the first series 23 foxes were used, and the results were checked by post-mortem examination. The combined results showed a 93 per cent. efficiency.

In the second series only four animals were used, and of these two failed to pass any parasites during life and were found free on post-mortem. Of the remaining two, one passed four worms and was found free on post-mortem, the other passed 123 worms and was found to have retained eight when killed a month later.

0·6 cc. was found to be a perfectly safe dose if given in capsules.

Two animals only were used in the third experiment. Both received the carbon tetrachloride as a drench; one at the rate of 0·3 cc. and the other 0·6 cc. per kilo.

In both cases temporary symptoms of intoxication were produced. The animal which received the smaller dose passed one hookworm and none was found at the post-mortem.

The other passed one ascarid and no worms were found at the post-mortem examination. Carbon tetrachloride was found to be far superior to chloroform and thymol.

REES-MOGG (G.). **The Treatment of Sclerostoma with Atoxyl.**—*Vet. Jl.* 1922. Mar. Vol. 76. No. 3. pp. 103–104.

Definite diagnosis of parasitic disease was made by examination of the faeces after two drenches, each composed of 2 oz. of turpentine, ½ pint of linseed oil and 1 pint of milk.

For three days a daily drench of thymol 1 oz., oil of chenopodium 1 oz., liquid paraffin 4 oz., milk and water 3 pints, was given.

Daily injections of 10 gr. of atoxyl and powders composed of 30 gr. of arsenic were also administered.

The drenches appeared to put the pony off her appetite, the quantity of thymol was therefore reduced to ½ oz., and only two were given per week. An increase to 60 gr. of atoxyl caused purgation, but the dose of arsenic was increased to that amount.

After three weeks the drenches were discontinued [it is not clear what interval elapsed between successive sets of three daily doses of the mixture containing thymol and oil of chenopodium] but the atoxyl and arsenic were continued for a month.

BRU (P.). **Le Chénopode anthelminthique.** [Chenopodium anthelminthicum.]—*Rev. Vét.* 1922. Apr. Vol. 74. No. 4. pp. 217–225.

The common name in France is Ansérine vermifuge.

Originally a plant of tropical America, *Chenopodium anthelminticum* is now found practically everywhere. It is especially cultivated in Maryland in the United States.

The particular variety used for the preparation of the essential oil is *Chenopodium ambrosioides* var. *anthelminticum.*

The seeds of the plant contain 0·6 to 1, and the leaves 0·35, per cent. of the essence. On an average the oil contains 65 per cent. of ascaridol, 22 per cent. of cymol, and some dioxyterpene.

It is soluble in alcohol, but is not miscible with other liquids.

The drug is particularly active against round worms. It should be given after a period of fasting of at least 24 hours and should be followed by a dose of linseed or castor oil.

In its action chenopodium does not differ from other vermifuges. It does not kill the parasites, but narcotizes them, hence the necessity for the administration of the purgative immediately after.

Should one treatment fail, which may happen if the purging is not sufficiently thorough, an interval of eight days must be left before the chenopodium is repeated.

The administration of the purgative immediately after the chenopodium not only ensures the expulsion of the paralysed worms but prevents gastric absorption, hastens the passage of the drug through the intestine and thus prevents absorption of it.

Cats appear to be more susceptible to its poisonous action than dogs.

In all animals and man large doses produce deafness, which, if the dose be sufficiently large, may be permanent. When excessive doses are given death results from paralysis of the respiratory centre.

For horses the dose varies from 15 to 20 cc.

In all cases it is preferable to divide the dose into three or more parts, which are given at intervals of an hour or more. In this way the parasites are subjected to the action of the drug for a more prolonged period.

In the dog the dose is 0·1 cc. per kilo.

It is best given in gelatin capsules on account of its objectionable taste and smell, and of the burning sensation it produces. In the absence of capsules it may be given shaken up in castor oil, but it soon rises to the top and makes the administration more difficult.

The alcoholic extract is miscible with glycerine and can be made into a syrup. Powdered seeds are more convenient for horses.

The dose is from 20 to 30 gm. in the form of an electuary repeated on two or three consecutive days and followed by a purging ball.

HALL (M. C.). **The Relative Value of Treatment and Prophylaxis in the Control of Parasitic Diseases.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Feb. Vol. 60. No. 5. pp. 583–599.

In this paper the author sketches outlines of the main factors involved in treatment and prophylaxis, and indicates the relative importance of each in certain cases. Broadly speaking, in the present state of knowledge treatment is more valuable than prophylaxis, but there are important exceptions. In some cases neither treatment nor prophylaxis are practicable.

SURCOUF (J.). **Note sur les Diptères piqueurs (Tabanidae) recueillis au Laos par M. Vitalis de Salvaza.** [Note on Biting Flies collected at Laos.]—*Bull. Soc. Ent. France.* 1921. Dec. 14. No. 19. pp. 285–287. [Reviewed in *Rev. App. Entomol.* 1922. Apr. Vol. 10. Ser. B. No. 4. p. 82.]

" The following new species are recorded from French Indo-China : *Tabanus euphanes, T. hypomacros, T. salvazai, T. oknos* and *T. ictericus.*"

CARPENTER (G. H.), PHIBBS (G.) & SLATTERY (T., the late). **The Warble Flies.**—*Jl. Dept. Agric. & Tech. Instruc. Ireland.* 1922. May. Vol. 22. No. 1. pp. 14–25.

The observations regarding the life-history of the fly which were published in 1914 have been confirmed ; it having been definitely established that the newly hatched maggots gain access to the host's body by penetration of the skin and not *via* the mouth.

It was again found that muzzling actually increased the average number of warbles found in the experimental calves. By licking itself an animal dislodges a number of the eggs.

Feeding calves with large numbers of maggots (100) failed to infect.

In experiments in which maggots hatched out artificially were placed on the skin, and eggs themselves were placed on the skin and kept in place by bandages, negative results were obtained.

On the other hand, calves which were protected by clothing, leaving only the hind legs exposed to the attacks of flies, showed maggots the following spring. The experiment further proved the migration of the maggots from the hocks, or below, to the backs. It was not found possible to trace the migrations of the young maggots from the skin to the oesophagus, where they are found in their " second stage " from October till February.

The larva appears to pass through five phases of development. The pupal stage ranged from 46 to 32 days, decreasing as the season advanced.

During 1915, washes composed of pure nicotine and linseed oil in proportions ranging from 1 to 0·25 per cent. were tried. The 1 per cent. was found to be very effective, but it produced alarming symptoms in some of the animals and its use was discontinued. In 1919, experiments with washes containing tobacco powder and lime gave promising results.

In 1921, departmental experiments were carried out with a wash containing 4 lb. of tobacco powder, 2 lb. of lime to 1 gal. of water In the majority of cases one dressing was given, with the result that

78 per cent. of the maggots were killed. In those cases (37 in number) in which two dressings were given, 89 per cent. of the maggots perished.

A more successful treatment still was the use of sulphur dioxide gas applied under pressure (with impermeable covers over the animals' backs) for a minute. By this means, which had previously been employed and had resulted in the destruction of 93 per cent. of maggots, 96 per cent. were killed. The method, however, is not applicable on a large scale.

As yet no dressing has been found which is effective for the prevention of oviposition, but experiments are being continued.

HADWEN (S.). **Effects following Improper Methods of Extracting Hypoderma Larvae from the Backs of Cattle.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Mar. Vol. 60. No. 6. pp. 724–728.

The disease described by BRODERSEN, in Denmark, as Rosenfeber, appears to be identical with hypoderma anaphylaxis. The symptoms recorded by the author are :—Fever, full pulse, distended jugulars, tremors, restlessness, oedema of dependent parts, lachrymation, and frothing at the mouth, slight tympanites and thin faeces. The breathing may be laboured. The course is acute but usually benign.

In previous papers by Hadwen, and Hadwen and BRUCE, additional symptoms were described : coughing, bleeding from the mouth and anus, irritation of the skin, and a cyanosed appearance of the body. Death may result from asphyxia. It is of the utmost importance that, if extraction of the larvae is undertaken, they should not be damaged in the process. Should a larva be broken the cavity should be flushed out quickly with water.

HILL (Laurence). **Three New Species of** *Trichodectes* **from** *Cephalophus monticola* **and** *Procavia capensis* **from South Africa.**—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 63–69. With 1 plate.

This paper contains a detailed description of three new species of lice, *Trichodectes bedfordi*, *Trichodectes lindfieldi*, and *Trichodectes serraticus*. The first of these were obtained from the blue duiker in Natal, and the last two from a Cape hyrax in the same Province.

MILLER (D.). **The Cattle Tick and other Ticks in New Zealand.**—*N.Z. Jl. Agric.* 1922. Jan. Vol. 24. No. 1. pp. 1–7. With 5 figs. and 1 map. [Reviewed in *Rev. App. Entomol.* 1922. May. Vol. 10. Series B. No. 5. p. 114.]

No tick-borne diseases occur among domestic animals in New Zealand. The species present in the Dominion are : *Haemaphysalis bispinosa*, *H. leachi*, *Hyalomma aegyptium*, *Ixodes ricinus*, *I. eudyptidis*, *I. apteridis*, *I. aptericola*, *I. anatis*, *I. intermedius*.

The first of these is the only one having a wide distribution. It chiefly infests cattle, but is common on rabbits and hares, and frequently attacks sheep, dogs and fowls. In some cases, horses are heavily infested and occasionally man.

ALLEN (J. A.) & WICKWARE (A. B.). **A Preliminary Note on Parasites infesting Domesticated Silver Black Foxes in Canada.**—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 27–28.

PROTOZOA.

Coccidium bigeminum—Isospora bigemina (Stiles, 1893). Small and large intestine.

ACARINA.

Sarcoptes scabiei vulpis (Fürstenberg, 1861) Railliet. Body.

Otodectes cynotis (Herring, 1838) .. .. External meatus, ears.

SIPHONAPTERA.

Ctenocephalus canis (Curtis, 1826) .. Body.

NEMATODA.

Eucoleus aerophilum (Creplin, 1839) .. Trachea and bronchi. Eggs found in trachea, oesophagus and faeces.

Belascaris cati (Schrank, 1788) .. ..
Belascaris marginata (Rudolphi, 1802) ..
Toxascaris limbata (Railliet & Henry, 1911)
Nucinaria polaris (Looss, 1911) .. .. } Small intestine.

TREMATODA.

Ascocotyle longa (Ransom, 1920) .. .. }
Echinochasmus sp. .. .. } Small intestine.

ERRATUM.

Vol. 10, page 39, third para. The bracketed insertion should have been deleted in proof. The genus *Bustomum* was created by Clayton LANE (1917), *Indian Jl. Med. Res.* Vol. 4, p. 419.

AUSTEN (E. E.). **Some Siamese Tabanidae.**—*Bull. Ent. Res.* 1922. Feb. Vol. 12. No. 4. pp. 431–455. With 7 figs.

BAYLIS (H. A.). **Observations on Certain Cestodes of Rats, with an Account of a New Species of** *Hymenolepis.*—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 1–8. With 4 text figs.

BEARD (J.). **The Fowl Tick.**—*Queensland Agric. Jl.* 1922. Jan. Vol. 17. No. 1. pp. 25–26. With 1 fig.

CHANDLER (A. S. A. C.) & SUTTLES (Charles L.). **A New Rat Tapeworm,** *Schizotaenia sigmodontis,* **from North America.**—*Jl. Parasitol.* 1922. Mar. Vol. 8. No. 3. pp. 123–128. With 1 plate.

CRAWLEY (H.). *Davainea proglottina,* **a Pathogenic Cestode in American Poultry.**—*Jl. Amer. Vet. Med. Assoc.* 1922. June. Vol. 61. No. 3. pp. 305–310. With 1 text fig.

CUNLIFFE (Norman). **Some Observations on the Biology and Structure of** *Ornithodorus savignyi,* **Andouin.**—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 17–26. With 3 text figs.

DOLLFUS (R. P.). **Sur la présence en France et en Corse du** *Bullinus contortus* **(Michaud), hôte intermédiaire de** *Schistosoma haematobium* **(Bilharz). Note préliminaire.** [Preliminary Note on the Occurrence in France and Corsica of *Bullinus contortus* (Michaud), the Intermediate Host of *Schistosoma haematobium* (Bilharz).]—*Bull. Soc. Path. Exot.* 1922. Apr. Vol. 15. No. 4. pp. 208–212.

FERRIS (G. F.). **The Mallophagan Family,** *Trimenoponidae.*—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 75–86. With 8 text figs.

HOPWOOD (A. T.). **An Interesting Case of** *Cysticercus fasciolaris* **infesting the Brown Rat.**—*Parasitology.* 1922. Apr. Vol. 14. No. 1. p. 14. With 1 plate.

LE BAS (G. Z. L.). **Of the Nature of the Antigen in the Complement-Fixation Test for Bilharzioses.**—*Jl. Trop. Med. & Hyg.* 1922. Mar. 1. Vol. 25. No. 5. pp. 49–55.

NEWSTEAD (R.). **A New Species of Phlebotomus from Trinidad.**—*Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 47–50. With 1 text fig.

NEWSTEAD (R.) & EVANS (A. N.). **A New Tsetse-fly from the South Cameroons.** — *Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 51–54. With 2 text figs.

ORTLEPP (R. J.). **On the Hatching and Migration in a Mammalian Host of Larvae of Ascarids normally Parasitic in Cold-blooded Vertebrates.**— *Jl. Trop. Med. & Hyg.* 1922. Apr. 15. Vol. 25. No. 8. pp. 97–100.

RILEY (William A.) & SHANNON (W. R.). **The Rat Tapeworm,** *Hymenolepis diminuta,* **in Man.**— *Jl. Parasit.* 1922. Mar. Vol. 8. No. 3. pp. 109–117.

ROGER (J.). **La dyspepsie parasitaire et le complexus symptomatique lié au parasitisme gastro-intestinal. Diagnostic et traitement.** [Parasitic Dyspepsia and the Symptom-Complex due to Gastro-intestinal Parasitism. Diagnosis and Treatment.]—*Rev. Vét.* 1922. Feb. & Mar. Vol. 74. Nos. 2 & 3. pp. 73–85 & 153–165.

SURCOUF (J.). **Diptères piqueurs du Laos. (Tabanidae), 2e Note.** [Tabanidae at Laos.]—*Bull. Soc. Ent. France.* 1922. Jan. 11. No. 1. pp. 13–15.

WATERSTON (James). **A Contribution to the Knowledge of the Bionomics of Sand-Flies.**— *Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 69–92. With 7 text figs. and 1 plate.

WHARTON (L. D.). *Opisthorchis wardi,* **a New Species of Liver Fluke from the Cat in the Philippine Islands.**—*Philippine Jl. of Science.* 1921. Aug. Vol. 19. No. 2. pp. 243–244. With 1 plate.

BACTERIAL DISEASES.

ZAMMIT (T.). **Undulant Fever in the Goat in Malta.**— *Ann. Trop. Med. & Parasit.* 1922. Mar. 31. Vol. 16. No. 1. pp. 1–10. With 2 plates.

Whereas the putting into force of an order requiring the boiling of all goat's milk for the naval and military forces in Malta produced an immediate disappearance of the disease from among them, there has not been any decrease of the disease among the Maltese population, because that precaution is not taken. It is, however, against the law for unboiled milk to be sold in hotels, restaurants, etc.

The goats number some 20,000, and these are subjected to periodic inspection, when samples of milk or blood are taken. Reacting goats are assessed and slaughtered. The staff available is not sufficient to allow for the examination of all the goats annually. From the figures given it appears that the number of goats examined annually since 1907 has ranged from 1,000 to 13,000, and that the average for the last few years has been between 5,000 and 6,000. The percentage of infected goats discovered in 1907 was 14, and for the last seven years it has been about 5.

This, however, is a dangerous percentage, as a single goat may infect a large number of people during a period of lactation.

Attempts to prepare a vaccine have as yet not yielded practical results of any value.

The author challenges a statement made by VINCENT (1918) to the effect that an infected goat recovers spontaneously, and states that he has never known an infected goat to recover. He states, nevertheless, that "the blood may completely lose its agglutinating power, but a careful post-mortem examination shows, as a rule, the micrococcus lurking in one or another of the glands."

It is also stated that a goat which has appeared to be perfectly healthy and free from an infection contracted two years previously yields milk teeming with *M. melitensis.*

KHALED (Z.). **A Comparative Study of Bovine Abortion and Undulant Fever, from the Bacteriological Point of View.**—*Jl. of Hygiene.* 1921. Dec. Vol. 20. No. 4. pp. 319–329.

In the investigations detailed in this paper 13 strains of *B. melitensis*, 10 of *B. abortus*, and 3 of *B. paramelitensis* have been examined. They are said to be representative of strains isolated in America, on the Continent, and in this country.

The author supports the view put forward by MEYER and FEUSIER that a special genus—"Brucella"—should be made for these three organisms.

A brief account of the morphology and cultural characters of the organisms is given.

In a section devoted to methods of infection the author states, in connexion with *B. abortus*, that after abortion takes place "The animal recovers and then either remains sterile or aborts soon after service, generally after two months. . . . . The males apparently act as carriers. The causal organism can be isolated from the spleen, liver, testes, seminal vesicles and uterine discharges, as well as from the milk; the foetal membranes, stomach, amniotic fluid and cotyledons as a rule give pure cultures. Isolation and disinfection are very effective measures."

Although 26 strains of the three organisms are mentioned in the early part of the paper, the author later states that 30 were used.

In the agglutination tests, details of the results with only 9 of these are given. Of these, 3 were *B. melitensis*, 2 *B. paramelitensis*, and 4 *B. abortus*.

Antisera, prepared from rabbits, were used against all of these. A serum was considered satisfactory only when it caused agglutination with the homologous organism in a dilution of 1 in 6,400.

Anti-*melitensis* serum agglutinated *B. melitensis* and *B. abortus* to about the same extent, and was practically inactive with *B. paramelitensis*.

Anti-*abortus* serum agglutinated all the nine strains to about the same extent, while anti-*paramelitensis* serum was active almost exclusively with its homologous organism, no agglutination taking place with any of the other strains in dilutions above 1 in 200.

In the absorption tests the results obtained with only five or six of the strains used are given, and only *B. melitensis* and *B. abortus* were used.

B. melitensis removed from anti-*melitensis* serum all agglutinins for *B. melitensis* and *B. abortus*.

B. abortus removed from anti-*melitensis* serum all agglutinins for the same organisms.

B. abortus removed from anti-*abortus* serum all agglutinins for *B. abortus* and *B. melitensis*.

B. melitensis removed from anti-*abortus* serum all agglutinins for *B. melitensis*, but not those of *B. abortus*; this organism was still agglutinated in dilutions of 1 in 800 after the absorption.

The author has carried out some experiments to test the relative pathogenicity of the organisms, "a few of which will be mentioned." Those mentioned lack, however, precision, and are of little value.

In a single experiment, inoculation of a monkey with *B. abortus* was found to confer some degree of immunity against a subsequent

inoculation with *B. melitensis*; the control monkey showed a febrile reaction to the test inoculation, which lasted a month, and continued to lose weight.

In regard to the pathogenicity for man, the author states that he has seen cases in Egypt which were typical undulant fever, confirmed by laboratory diagnosis, in persons who have never ingested goat's milk. He suggests that *B. abortus* bears to *B. melitensis* a relationship similar to that of cowpox to smallpox.

Skarić (J.). **Über die Beziehungen des** *Bac. melitensis* **(Bruce) zum** *Bac. abortus infect. bovum* **(Bang).** [The Relationship between *B. melitensis* and *B. abortus*, Bang.]—*Zeitschr. f. Hygiene u. Infektionskrankh.* 1922. Mar. Vol. 95. No. 3. pp. 358–364.

The author has carried out a number of tests with different strains of abortion bacilli and undulant fever organisms and with immune sera prepared by means of these. The results are parallel with those obtained by other investigators.

He suggests that agglutination shown by the serum of patients with undulant fever bacilli may possibly be due to agglutinins elaborated as a result of the ingestion of milk containing abortion bacilli.

Ziemann (H.). **Ueber die Behandlung des Maltafiebers und des infektiösen Abortes der Rinder mit Kollargol und ähnlichen Präparaten.** [The Treatment of Malta Fever and Contagious Abortion of Cattle with Collargol and Similar Preparations.] *Deut. Med. Wochenschr.* 1921. May 5. Vol. 47. No. 18. p. 500.

The author states, in this brief note, that he has been able to effect a cure in cases of undulant fever by intravenous injections of a two per cent. solution of Collargol. The dose was from 2 to 4 cc.

In one case a single injection sufficed, but in others a second injection was given. In the absence of further cases upon which to try the method he has turned his attention to contagious abortion because of the similarity of the causal organisms. It is not clear that he has actually carried out any experiments in this connexion. No results are given.

Little (Ralph B.) & Orcutt (Marion L.). **The Transmission of Agglutinins of** *Bacillus abortus* **from Cow to Calf in the Colostrum.**—*Jl. Experim. Med.* 1922. Feb. 1. Vol. 35. No. 2. pp. 161–171.

"The experiments to be reported differ from those of others in that they deal with the naturally acquired and stored agglutinins as the result of a definite infectious disease of cows, localized in the foetal membranes. Earlier experiments deal only with agglutinins experimentally induced."

The bulk of the paper is composed of tabular statements of the various experiments carried out, and these do not lend themselves readily to abstraction.

The authors state that, with rare exceptions, the blood of a new-born calf is free from agglutinins until it has sucked, although

the blood and the colostrum of the dam may have a relatively high content of agglutinins.

When colostrum was withheld, and milk of a low or negative titre substituted, agglutinins failed to appear or accumulate in the blood of the calf.

The concentration of agglutinins in the colostrum may exceed that of the blood at or immediately after parturition.

Agglutinins begin to appear slightly over an hour after the calf has ingested colostrum, and in nearly all cases were at a maximum five hours after feeding.

The problem of the production of agglutinins by the foetus in whose tissues *B. abortus* has multiplied, and which is subsequently expelled prematurely, is not touched by these observations.

SCHROEDER (E. C.). **Bureau of Animal Industry Investigations on Bovine Infectious Abortion.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Feb. Vol. 60. No. 5. pp. 542–561.

This paper, which was read before the United States Live Stock Sanitary Association, gives a summary of our knowledge regarding the various aspects of contagious abortion.

NEWSOM (I. E.) & CROSS (F.). **Investigations on the Use of Vaccines made from** *Bacillus ovisepticus.*—*Jl. Amer. Vet. Med. Assoc.* 1922. Feb. Vol. 60. No. 5. pp. 562–579.

The publication of the results obtained by Van Es and MARTIN has led to questions not only as to whether the vaccines on the market are of any value against diseases of the haemorrhagic septicaemia group, but whether there is any secure basis for the methods employed.

As various investigators have had non-concordant results with the methods involving the use of killed or virulent living organisms, the authors have carried out a small number of experiments with vaccines both dead and living.

The first experiments were carried out with rabbits. Broth cultures were used. These were found to contain 7–10 billion organisms per cubic centimetre. The minimum lethal dose of these cultures for rabbits was found to be ·000,001 cc. ; an animal receiving one-tenth of this dose survived.

The dead vaccine was a broth culture of the same strength. It was killed by heating at 60° for 30 minutes, and 0·5 per cent. carbolic acid was afterwards added.

Rabbits given varying doses of vaccine and subsequently varying doses of virulent culture in doses ranging from ·001 to ·000,000,1 cc. all died. The vaccines therefore had no immunizing effect. The test doses were given in one case after an interval of 11 days and in another case 17 days. Young lambs given 2 cc. of vaccine all succumbed when given test inoculations at 11 days interval.

Two lots of vaccine prepared commercially were tested, and, in a small number of experiments carried out with lambs, one of these was apparently of some value in conferring a slight degree of immunity. No details are given of the manner of preparing these vaccines.

Vaccines which were carbolized without having been killed by heat appeared, in the four animals treated, to have some immunizing value.

An experiment in which carbolized (unheated) culture was used as the vaccine, and the test inoculation was given subcutaneously instead of intravenously, as in the previous experiments, failed to provide any definite information, as two of the three controls recovered.

The administration of increasing doses of carbolized vaccine (up to a final dose of 20 cc.) subcutaneously was found to increase the agglutinin content in one instance but not in another. The subsequent intravenous inoculation of these animals with increasing doses of culture up to a maximum dose of 15 cc. caused a further rise in the agglutinin content. In neither case was agglutination caused in a dilution higher than 1 in 250.

In a test with a small number of sheep (three in each batch) the result indicated that live vaccine produced a higher degree of immunity than carbolized vaccine.

The authors conclude that there would probably be little risk in using live vaccines for the subcutaneous inoculation of sheep, but that probably the minimum lethal dose of every strain used for the production of vaccine would have to be determined.

The authors have not had any results comparable to those of MIESSNER and SCHERN, whose culture was fatal to sheep in doses of a few loopfuls.

ZSCHOKKE. **Versuche zur Herstellung eines flüssigen Rauschbrandimpfstoffes.** [Experiments regarding the Production of a Liquid Vaccine against Black Quarter.]—*Schweiz. Arch. f. Tierheilk.* 1922. Mar. Vol. 64. No. 3. pp. 97–105.

The author describes results obtained from the immunization of animals with filtered subcutaneous exudate and peritoneal fluids.

By a process of inoculating the cattle with infective material subcutaneously in about twenty different places at the same time, it was found that an ox would furnish about eight litres of subcutaneous and peritoneal exudate. This was mixed with carbolic acid 0·5 per cent. and promptly filtered.

A large part of the article consists of a tabular statement of the experiments carried out. This does not lend itself to abstraction. The author's conclusions may be summarized as follows :—

Germ-free exudates may be used for the inoculation of animals, and even when large doses are given produce no toxic effects. The injection produces a solid immunity. The dose required to effect this is 0·5–1 cc. for a guinea-pig and 1–2 cc. for an ox. The peritoneal exudate is rather less effective than the subcutaneous fluid—about twice the dose is required for the immunization of guinea-pigs.

The immunity is an active one. It is not acquired until ten days after inoculation and lasts five months at least. The immunity is effective not only against the strain used for the production of the virus, but against other strains as well.

When kept in the cool and the dark the vaccine retains its power for four months, after which it slowly becomes less and less effective.

Six thousand doses have been used in general practice. The results will be published later.

MARZINOWSKA (A. F.). **[On the Rôle of Wild Birds in the Dissemination of Chicken Cholera.]**—Reprinted from *Medicinskoye Obozreniye* (*Med. Review*). Moscow. 1916. No. 5–6. 5 pp. With 1 plate.

The author isolated an organism which was the cause of a severe outbreak of chicken cholera amongst wild rooks and crows in Moscow in 1914. It differed slightly from the bacillus of chicken cholera in its mode of growth in cultures and in its pathogenic properties, on account of which the author proposed to name it *Bacillus avisepticus corvinus*. Cultures of this organism were successfully inoculated into pigeons, producing symptoms of chicken cholera and causing their death. In natural conditions the disease seems to be disseminated through the faeces of infected wild birds. A jackdaw placed in a cage which contained the excrements of infected birds contracted the disease in three days and died on the fourth.*

CARINI (A.). **Phenololipoid N. in Experimental Infection by** *Micrococcus melitensis* **(Chemotherapic Notes).**—*Jl. Trop. Med. & Hyg.* 1922. Jan. 2. Vol. 25. No. 1. pp. 1–2.

GHINEA (I.). **Contributions à l'étude du diagnostic de la morve chez le mulet par la malléine.** [The Diagnosis of Glanders in the Mule by means of Mallein.]—*Archiva Veterinara.* 1921. Vol. 15. No. 3. pp. 97–118.

MARSHALL (C. J.). **Haemorrhagic Septicaemia.**—*Jl. Amer. Vet. Med. Assoc.* 1922. June. Vol. 61. No. 3. pp. 238–242.

UCHIMURA (Y.). **Experimentelle Untersuchungen zur Biologie des Rauschbrand-bacillus.** [Experimental Investigations of the Biology of the Bacillus of Black Quarter.]—*Zeitschr. f. Hyg. u. Infektionskrankh.* 1921. May. Vol. 92. No. 2. pp. 291–320.

DISEASES DUE TO FILTERABLE VIRUSES.

EICHHORN (A.) & LYON (B. M.). **Prophylactic Vaccination of Dogs against Rabies.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Apr. Vol. 61. No. 1. pp. 38–42.

The authors' investigations were undertaken with a view to check results claimed by UMENO and DOI in Japan.

During the war rabies spread very widely in Japan, and attempts were made to inoculate dogs against it. The claim is made that a degree of immunity sufficient to protect dogs for a year can be established by a single injection of a special preparation of fixed virus. The brain and spinal cord of a rabbit dead of fixed virus rabies is ground up and mixed with four volumes of a mixture of glycerin 60 parts, water 40 parts, and carbolic acid 1·25 parts. This mixture is stored at 18°–22° C. (*i.e.*, room temperature) for two weeks, or in an ice chamber for three weeks, to reduce its virulence.

At first the vaccine was used diluted, but subsequently at the strength given.

---

* Summarized by Mr. Cecil A. Hoare, B.Sc.

It is said that this vaccine retains its properties for two to three months at room temperature.

A number of experiments were made with a view to determine the dose, and it was finally established that one injection of 5 cc. per 15 kilos weight of the one-fifth dilution should be used.

Up to 1921 31,307 dogs were vaccinated in two Prefectures in Japan. Only one animal died from accidental causes following vaccination, and in one instance the vaccine failed to protect against natural exposure to infection. As a result of the vaccinations the cases were reduced by 75 per cent., and the disease occurred only among unprotected dogs.

To test the value of the method the authors of the present paper injected six dogs subcutaneously with 5 cc. of vaccine, and 25 days later these, along with three unvaccinated controls, were inoculated intraocularly with 0·05 to 0·1 cc. of a suspension of brain material from three dogs known to have died from rabies; the suspension was made up of 10 per cent. strength in salt solution.

The six protected dogs lived and the three controls died in 15 to 17 days.

Six rabbits were inoculated—two from each—from the control dogs. Four died of rabies, one from shock and one survived. The deaths were distributed among the three batches.

Pool (W. A.) & Doyle (T. M.). **The Preparation of Anti-Rinderpest Serum, using Animals of Moderate Susceptibility as Virus Producers. Part I. Buffaloes.**—43 pp. 1922. Bulletin No. 129. Agricultural Research Institute, Pusa. Calcutta: Supt. Govt. Printing.

The work described in this Bulletin was undertaken with a view to decide whether it is absolutely essential that animals possessing a high degree of susceptibility to rinderpest should be used as virus producers.

In the absence of any experimental evidence to the contrary it has been held that for the production of a potent serum the animals furnishing the virus for hyperimmunization should be as susceptible as possible.

The authors show that the problem of obtaining highly susceptible cattle for this purpose at Muktesar is, after having been increasingly difficult of solution for a number of years, now becoming insoluble.

With an ever increasing demand for serum and an ever diminishing supply of susceptible cattle for virus production steps had to be taken to find some substitute. Attention is also called to the possible results of an extensive outbreak of rinderpest in the areas of the Kumaun Hills, from which the highly susceptible virus producers have been drawn.

For many years the question of establishing further laboratories for serum production in India has been under discussion, and at different times actual selections of sites have been made, only to be abandoned on the score that susceptible animals were not available in sufficient numbers within reach of the proposed site.

Young male buffaloes, regarding which the Indian has no religious prejudices, as he has in the case of bovines, have been used in emergency as virus producers in the past, but only when inoculated direct from hill bulls.

It was therefore necessary to ascertain whether virus maintained by passage from buffalo to buffalo retained a sufficient degree of virulence to be serviceable for hyperimmunizing purposes, and whether buffaloes hyperimmunized with such virus would produce an efficient serum.

A series of experiments has therefore been carried out in which young buffaloes were solely used for the production of virus and large buffaloes for the production of serum.

In all, eleven brews of serum, each comprising 10,000 doses (5 cc.), have been prepared upon this plan, and the potency of eight of the brews has been tested on hill bulls in the usual way.

The conclusions arrived at are :—

1. A potent anti-rinderpest serum can be prepared from virus producers which have only a moderate susceptibility to the disease.

2. The continued use of buffalo antigen did not produce any deterioration in the potency of the serum prepared up to one lakh and 10,000 doses involving 34 subpassages.

PIOT-BEY (M.). **A propos des vaccinations antipestiques par le procédé Gordziakowski.** [The Gordziakowski Method of Immunizing against Rinderpest.]—*Rec. Méd. Vét.* 1922. Apr. 15. Vol. 98. No. 7. pp. 194–197.

The author draws attention to the fact that in 1883 he attempted to immunize animals against rinderpest by a single injection of virus heated to 54°. The virus was subjected to this temperature for twelve minutes. The temperature and the duration of the heating were arrived at by experiment.

During the year mentioned 1,004 head of cattle were inoculated with this heated virus. The results were at first excellent, then doubtful, and finally the author was lead to conclude that the results were not sufficiently constant to warrant the application of the method without modification.

Attention is drawn to these points only for the purpose of showing that heated virus is entirely innocuous.

The light shed upon the nature of the disease shows how idle it is to try to prepare a vaccine, and the author thinks, therefore, that GORDZIAKOWSKI has been following a wrong track in his attempts to prepare a vaccine by heating the virus.

XÉMARD, who has found the method useless in a small number of experiments in West Africa, failed to get any evidence of systemic reaction following the inoculations. GORDZIAKOWSKI claims to have produced a rise of temperature in practically all the animals treated, and clinical symptoms followed by death in from six to eight days in three of the animals treated.

These results were obtained on infected premises where the disease was certainly incubating. This explains the three deaths. One is forced to the conclusion that either the blood was heated sufficiently to destroy its virulence, or that it was insufficiently heated and conveyed the infection.

The results obtained in Poland should have lead the operator to conclude that his first vaccine had been without effect. The immunity shown to have been established by the second inoculation with virulent blood twelve days later was natural and certainly not due to the vaccine.

The author suggests that where simultaneous inoculation is impracticable on the score of shortage of staff or funds, isolation should be tried as offering the next best chance of controlling the disease.

HENRY (M.). **Some Untoward Results following Inoculation against Pleuropneumonia Contagiosa in Bovines.**— *Vet. Jl.* 1922. Apr. Vol. 78. No. 4. pp. 139–145.

During 1921 a somewhat extensive outbreak of pleuropneumonia occurred in a dairying district in New South Wales which had been comparatively free for some time. The infection was apparently brought in by a particular mob of cattle which were sold and distributed over the district. The outbreak was dealt with in the usual way; viz., infected premises were quarantined, affected animals destroyed, and incontacts inoculated.

"Natural virus" was used for the purpose, and this was obtained in the following way. An affected animal was selected and killed by shooting or stunning and bled. Care was taken not to damage the trachea. With the animal lying with its head downhill the abdominal organs were removed. A slit was then made in the diaphragm and with a sterilized enamelled cup the exudate was baled out and poured into a sterile bottle. This was used for the inoculation of incontacts, in most cases without preservative, but in one case 30 per cent. glycerin was added. The virus was used to impregnate strands of worsted about an inch long, and these were inserted into the tail about an inch from the tip. Although the protection afforded could not in any instance be said to have broken down, the results were very variable. These are given in detail for 15 farms, and are also tabulated.

Virus.	Taken.	Used.	Herds Inoculated.	Inoculated by.	Result.
No. 1 ..	24/8/21	25/8/21	Farm B. (19) ..	B.	A. 3.
		25/8/21	Farm D. (26) ..	B.	—
		25/8/21	Farm E. (26) ..	B.	D. 8.
		30/8/21	Farm F. (31) ..	B.	A. 3.
		20/8/21	Farm G. (24) ..	B.	A.14. D. 3.
		5/9/21	Farm K. (50) ..	A.	—
No. 2 ..	29/7/21	6/9/21	Farm C. (24) ..	C.	D. 3. A. 4.
		27/8/21	Farm H. (24) ..	A.	D. 1. A.11.
		29/8/21	Farm I. (40) ..	A.	A. 6.
		29/8/21	Farm J. (35) ..	A.	D. 4. A. 9.
		29/8/21	Farm L. (26) ..	A.	A. 2.
		6/9/21	Farm N. (18) ..	A.	D. 1. A. 3.
			Farm O. (60) ..	B. 20 A. 40	D. 1. A. 2.
No. 3 ..	12/8/21	22/8/21	Farm M. (25) ..	B.	—

D. = Deaths. A. = Amputations. Numbers in parentheses indicate numbers in herds. A. B. and C. = persons carrying out inoculations.

It will be seen that Operator B. used virus No. 1 on three farms on the same day, and that on one premises eight died, on another three tails were amputated, and on the third there were no ill effects. The standard of management on these three farms was good, average, and poor respectively. Contaminations in the virus would not appear to be the explanation, because when the virus was used ten days later

by A. on another farm there were no bad results. The method of inoculation used could hardly be the explanation, as the results following inoculations with virus No. 2 injected by A. were even more serious.

There was no evidence that pyogenic bacteria were responsible, nor were injuries to the caudal bones the cause.

Many cases were examined, ante- and post-mortem, and in all cases the lesions presented similar appearances. The skin, except where it had become necrotic, was normal. The connective tissues, superficial and deep, were markedly oedematous. The latter presented an appearance recalling that shown by the lungs in a typical case, in that there were strands of fibrous tissue surrounding cavities containing exudate—these taking the place of the lung tissue in a typical lung lesion. The muscular tissue was normal.

Although the reactions were severe these were in some cases very delayed. In the majority of cases the period of incubation was three weeks, but in some it was delayed to six or seven weeks.

Among the factors contributing to the results was the fact that the majority of the animals inoculated were dairy cows in milk; this meant two journeys a day from the paddocks, and, where management was not very good, a certain amount of rough handling and tail twisting.

MONTGOMERY (R. Eustace). **On a Form of Swine Fever Occurring in British East Africa (Kenya Colony).**—*Jl. Comp. Path. & Therap.* 1921. Sept. & Dec. Vol. 34. Nos. 3 & 4. pp. 159–191; 243–262. With 4 charts.

The work reported in this paper was spread over the years 1900 to 1917, and publication was delayed by the author's transfer to other parts of Africa. It is acknowledged that the work is incomplete, but as there appears to be no immediate prospect of continuation of the research, he has thought it advisable to publish an account of his investigations.

A paper of this length, packed as it is with experimental data, does not lend itself readily to abstraction, but the main results may be gathered from the author's summary as follows:—

Swine fever was first diagnosed in East Africa in 1910. Between that date and 1915, 15 naturally occurring outbreaks were recorded. The total number of pigs involved was 1,366, and of these 98·9 per cent. died.

The disease is very rapidly fatal, death taking place within 48 hours. The symptoms are those of an acute febrile disease. Diarrhoea is rarely observed. Cyanosis of the skin is an obvious symptom in white pigs. Paresis and inco-ordination of the hindquarters are marked.

The lesions found are those of a septicaemia: Haemorrhagic gastritis, enlargement of the spleen, petechiae in the kidneys and on the cardiac walls, oedema of the lungs, general enlargement of the lymphatic glands. The presence of diphtheritic deposits in the intestines is extremely rare.

After inoculation the period of incubation is about three and a half days and the average duration of reaction is four days.

Only domestic pigs (the progeny of imported stock) show symptoms of the disease. The wild pig harbours the virus in the blood after inoculation, but shows no external evidence of infection.

Blood, serum, thoracic and peritoneal fluids, urine, faeces and bile have been proved to be capable of causing infection.

Simple contact is a very sure way of transmitting the infection. Experimental feeding with infective material is uncertain.

The virus is ultravisible and passes through Berkefeld and Chamberland F. filters. The virus may be preserved for at least 18 months; decomposition and desiccation act destructively upon it.

It is less stable when heated than the European virus. It resists 50° C. for three and a half hours, but 60° C. proves fatal after ten minutes exposure. Heating at 55° C. for half an hour generally causes a reduction in virulence. An exposure to 50° C. for four hours produces a similar effect. In these less acute cases diphtheritic deposits may be found in the intestines.

Pigs in contact with infected pigs which are not showing any objective symptoms may fail to contract the disease if the infected pigs be removed before symptoms become developed.

Styes readily lose their infectivity. The styes are almost certainly free from danger if left unoccupied for ten days.

The ingestion of a pig dead of the disease by others may set up the disease in them. Immediate contact between healthy and diseased is necessary for the transmission of the infection.

The source of the virus remains a matter of doubt. The outbreaks which occurred among the domestic pigs could not be connected with each other in any way. There would appear, therefore, to be some reservoir. Experiments with bush-pig and wart-hogs are too scanty to permit of any sound conclusions being drawn, but it was proved that the virus persisted in the blood of an inoculated bush-pig up to 17 days.

The view is put forward that in nature the virus is maintained through the carnivorous habits of swine, and not by ordinary contact. Recovery does not establish absolute immunity, but a certain degree of resistance only (save in one case).

Anti-swine fever serum prepared in England and in Hungary appeared to be quite ineffective.

The serum of the pig which had aquired complete immunity was valueless for protective purposes. Pigs immune to English swine fever contracted a fatal infection with the East African strain.

Virus heated to a point which produced attenuation appeared to confer some immunity.

Subacute pulmonary and intestinal changes which were sometimes observed are considered to be due to some cause other than the virus.

SPREULL (J.). **Heartwater.**—*Jl. Dept. Agric. (S. Africa).* 1922. Mar. Vol. 4. No. 3. pp. 236–245.

The main object of this paper, published as it is in an agricultural journal, is to impress upon farmers the extreme importance of dipping, but it is valuable apart from this in that it summarizes our existing knowledge of the disease.

Heartwater is defined as a specific febrile disease affecting sheep, goats and cattle in South Africa, due to an ultravisible virus transmitted by the bont tick *Amblyomma hebraeum*. It derives its name from the most prominent lesion, namely, effusion of plasma into the pericardium and chest cavity.

The disease is transmissible by inoculation with blood, spleen pulp, effusions, and milk from a freshly dead animal.

The blood remains infective for a short time only after the temperature has become normal, but animals may become affected a second time. It has been shown that a single tick is sufficient to transmit the disease.

Prior to the introduction of dipping, heartwater rendered sheep and goat farming impossible in the lower lying areas, and it is still a scourge in low veldt districts in the Transvaal.

While small stock generally are susceptible to infection, the susceptibility varies with different breeds. The Angora goat is the greatest victim, then the Boer goat, Merino sheep and its crosses, and the Afrikander. Persian sheep generally escape with a febrile attack only. Cattle are less susceptible than sheep. The springbok is known to be affected occasionally. Horses are insusceptible.

Transmission naturally is by the tick. The infection does not pass through the egg, but a tick picking up the infection in one stage transmits it in the next. If the next stage is passed on an insusceptible animal the tick does not thereby lose its infectivity.

Amblyomma hebraeum is the principal infecting tick, but *A. variegatum* is also capable of transmitting the disease.

The life-cycle of *A. hebraeum* is as follows: Egg-laying begins in 2–12 weeks after engorgement, and lasts for 3–9 weeks. Hatching takes place in 4–6 months on an average, but the period may be shorter or longer, depending upon the temperature.

Time of engorgement of the larva 5–7 days. Moulting of the larva takes 1–3 months. Engorgement and moulting of the nymph require 4–8 days and 4–12 weeks respectively. In the final stage the female seeks the male after he has fed for several days, and copulation takes place while both are attached. The female remains attached for 10–20 days, while the male may remain for several weeks and probably mates again.

The complete life-cycle therefore occupies a period of not less than 9 months, and may amount to two years. Further larvae, nymphs, and adults may live 7, 6, and 12 months respectively without having access to a host.

The tick requires a certain degree of warmth and moisture for its maintenance, and although it is annually brought on to the high veldt it has not become established there. LOUNSBURY has shown that moulting at very low temperatures deprives them of their infectivity, but that warming them in an incubator prior to placing them on a host restores that virulence.

The lesions of the disease are sometimes inconspicuous. The presence of serous fluid in the chest and pericardium is characteristic but not invariable. The fluid is in the nature of a transudate; there is no true pleurisy or pericarditis. The liquid clots quickly when it is withdrawn.

There may be some peritoneal effusion, and the fourth stomach may show inflammatory changes in the mucous membrane, including tiny blood markings. The spleen is enlarged and softened. The brain and membranes are congested, and the spinal fluid in excess.

In cases of natural infection the period of incubation is 11–18 days. By intravenous blood inoculation the period of incubation may be reduced to 10 and 5 days, depending upon the dose given. By subcutaneous inoculation the period may be from a fortnight to three weeks.

The symptoms are most obvious in the goat, and usually the first to be observed is stiffness. If such a goat be urged to move, evidence of respiratory distress will make its appearance. Depression and cessation of rumination are observed soon after. Evidence of nervous

disturbance is seen in some cases from the onset, squinting eyes, bleating, salivation and chewing movements, etc. A single fit or a succession of them may be seen in some cases.

In some cases death occurs without any premonitory symptoms being observed.

In a period of some weeks after recovery from a severe attack both sheep and goats will cast their fleece.

The fever reaction is peculiar. It usually rises abruptly to 105 or 106°, remains there for a day or two and drops just as suddenly. It may be subnormal shortly before death.

In cattle the symptoms are not so pronounced, and it appears to be highly probable that animals reared on infected veldt acquire immunity. In small calves the symptoms resemble those seen in the goat, but are not quite so marked.

Death usually occurs on the fourth day. The death-rate may sometimes be as high as 50 per cent.

Medicinal treatment is of no value; isolation in the shade is the best plan to adopt.

Immunity is very difficult to produce, and even infection by ticks is not effective, and animals have been known to have two attacks within a year. Blood retains its virulence for 48 hours or so, but not longer. It cannot be preserved by the addition of antiseptics. It is destroyed by heat and desiccation. The bile is non-infective and non-immunizing. Hyperimmunization produces a serum capable of conferring a very brief immunity. Double inoculation is useless.

Prevention.—Change of pasture to high veldt brings about a cessation of the disease in three weeks. On low veldt two changes at intervals of three or four weeks checks the mortality.

Starving the ticks by removing susceptible animals for a period of two years is effective, but generally not practicable.

The grazing of Persian sheep on infected land would not cause any mortality, but the infection would be kept alive in the ticks.

Burning the grass is inefficient, as ticks in crevices in the ground escape.

The only reliable method of dealing with the disease is by dipping. With a view of dealing with heartwater, sheep and goats should be dipped two or three times at intervals of ten days. But dipping to be effective must be a continuous policy of tick destruction; and to get the best results the principal host of all ticks, namely cattle, must be treated. The dipping should be practised at short intervals, as with intervals of a fortnight proper tolerance to the arsenic and proper saturation of the skin with the drug is not achieved.

The author states that in two years the worst tick infested property can be freed if the dipping be regular and thorough.

HENLEY (R. R.). **Clarification of Hog-Cholera Defibrinated-blood Antitoxin.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Mar. Vol. 60. No. 6. pp. 717–723.

The method described is applicable to carbolized serum in which the haemoglobin of disrupted corpuscles has been set free.

MANN's statement that haemoglobin could be precipitated by chloroform was tested, and the results obtained at first were not satisfactory. Subsequently it was discovered that complete precipitation could be effected if the blood contained at least 0·5 per

cent. carbolic acid, if the temperature of the blood did not exceed 40° F. when the chloroform was added, and if the mixture was thoroughly shaken.

The process is described in detail, and the following are the important steps :—

1. The defibrinated blood, containing 0·5 per cent. carbolic acid, is cooled to 40° F. or lower, and to 500 cc. DORSET and HENLEY's bean extract is added in the proportion of 2–3 per cent. The flask is shaken.

2. Chloroform in the proportion of 10 per cent. is then added, and the flask again shaken.

3. To be carried out only when the serum is to be separated from the clot by filtration (see later). Five grammes of salt are added and the mixture transferred to a shaking machine.

4. Shaking must be done promptly after adding the chloroform to ensure the maximum precipitating effect and to prevent the formation of a clot in the bottom of the flask. Shaking is continued for ten minutes. This produces a semi-solid clot from which light red serum will exude on standing.

5. When the serum exudes the clot is easily broken up by shaking by hand and is reduced to a more fluid consistence. Separation of the serum may be effected by centrifuging either in a bucket or "continuous" machine, or by filtration through paper. For the latter purpose special trays, and not funnels, are used. It is claimed that a 50 per cent. yield may be obtained by the filtration direct, and that a further 15 per cent. may be obtained by pressing the clot and paper in a fruit press (the clot and paper being first enclosed in a muslin bag).

Serum so obtained may be heated to 58° C. for half an hour.

A serum carbolized to 0·5 per cent. when clarified by this method is found to contain on an average only 0·2 per cent. This deficiency must be made up or the serum will not keep.

The yield is generally rather over 60 per cent. of the total volume treated.

The loss of globulins, which "carry the antitoxin," was estimated at about 10 per cent.

The process renders the serum sterile.

It is noteworthy that as the process described differs from the bean salt process only in the use of chloroform, it was not considered necessary to carry out any extended tests of the potency of the serum. In fact only one test was carried out, and the number of pigs used is not mentioned.

DUVAL (C. W.) & COURET (M.). **The Purification and Concentration by Desiccation of Hog Cholera Immune Serum.**— *Jl. Med. Research.* 1921. Oct.–Dec. Vol. 42. No. 5. pp. 503–514.

The authors state that the hog cholera serum now in use is not free from objection in that it gives a low "percentage of protection," and that in the quantity recommended by the Bureau of Animal Industry protection lasts only three or four weeks.

They hold that improved results are obtainable by using serum which has been freed from corpuscles—the hog cholera serum in use being actually carbolized defibrinated blood—desiccated, and redissolved in a small volume of solvent.

The method which they have devised is given more or less in outline only.

It is claimed that the desiccated and powdered serum will retain its potency for years, and, further, that it may be mixed with virulent serum and kept for months, the virus and the antiserum both retaining their properties.

FONTELA (J. M.). **La fiebre aftosa y su contagio a la especie humana.** [The Susceptibility of Man to Foot and Mouth Disease.]—*Revista Zootec.* 1922. Mar. 15. Vol. 9. No. 102. pp. 62–78.

MYCOTIC DISEASES.

LARIEUX. **Contribution à l'étude du traitement de la lymphangite epizootique.** [The Treatment of Epizootic Lymphangitis.]—*Rec. Méd. Vét.* 1922. Mar. 30. Vol. 98. No. 6. pp. 131–137.

A certain cavalry barracks was used during the war as a veterinary hospital, in which there were cases of epizootic lymphangitis from time to time. In spite of disinfection, cases of the disease began to make their appearance when the barracks were again occupied by cavalry after the war. The first case developed in December, 1919, and during the next 16 months 36 animals were under treatment for the disease. Five of these were given etherized pyo-vaccine, but from September, 1920, onwards all were given heated culture emulsions prepared according to the technique of BOQUET and NÈGRE. Weekly doses were given beginning with 1 cc. and increasing by 1 cc. weekly up to a maximum of 5 cc. This dose was given until recovery took place.

FORGEOT, who used this method, obtained 65 per cent. of recoveries. The author gives a tabular statement of 31 cases which came under his care. From this the following information may be gathered. The period of incubation ranged from 40 to 212 days. The number of doses of vaccine given varied from 3 to 18. The course of treatment was from 21 to 252 days. In many cases surgical treatment, such as point firing (the abscesses) and curetting, was resorted to. In ten cases the animals were slaughtered, and recovery took place in the remainder.

In no case did deep point firing of the abscesses suffice to arrest the progress of the disease.

It was observed that if obvious improvement does not take place after 8 or 10 injections, the lesions may heal up completely if the vaccination is stopped. If favourable results are not obtained the probability is that the Preisz-Nocard bacillus is also present in the lesions. It is probable that had the use of the vaccine been limited to cases for which the cryptococcus alone was responsible, the percentage of recoveries would have been higher.

In the discussion which followed, TRUCHE drew attention to the difference in the period of incubation of the natural disease and that set up by experimental inoculation. NÈGRE and BOQUET found that inoculation with pus produced lesions more promptly than inoculation with culture, the periods of incubation being 15–20 and 30–40 days respectively. The average period of incubation as given by Larieux's figures is 117, and this agrees closely with that obtained by

other observers. Emphasis is laid upon the necessity of resorting to artificial culture for diagnostic purposes. Microscopic examination is held to be insufficient.

In cases of mixed infection the cryptococcus vaccine may be given first, followed by vaccines against other organisms present.

MISCELLANEOUS.

PAVLOVSKY (E. N.). **Description of a Box for Collecting and Transporting Living Insects, etc.**—*Parasitology.* 1922. Apr. Vol. 14. No. 1. pp. 47–50. With 1 text fig.

The box here described is a modification of one seen by the author at the Natural History Museum, Simpheropol, in 1911, the originator of which he has been unable to discover.

The external measurements of the box are 45 cm. by 31 cm. by 5·5 cm. The bottom is made of wire gauze with a 0·5–1 mm. mesh. The top is in three sections opening independently, hinged at one side, and supplied with suitable fastenings at the other. The interior of the box is divided by eight continuous transverse partitions which are slotted to take small partitions dividing the long compartments into six small ones. At the end of each long partition is an extra slot to take one of the cross partitions if it is desired to increase the size of one or more of the small compartments. The lid is provided with holes about an inch in diameter and each hole is provided with a cork. This is for the introduction of specimens into the box.

The small compartments may be again subdivided by plates of tin cut to suitable shape.

Such boxes may be conveniently stacked for transport, the gauze bottom of one resting on the corks of the next below it.

The figures (p. 93) show the details of construction clearly.

DODD (S.). **Tick Paralysis.**—*Jl. Comp. Path. & Therap.* 1921. Dec. Vol. 34. No. 4. pp. 309–323.

The occurrence of a form of paralysis accompanied by other symptoms is well known along the Eastern Coast of Australia, and it has been associated with the bite of a hitherto undetermined tick. In this paper the author gives details of his experiments and observations and also definitely incriminates *Ixodes holocyclus*. The disease is seen during the spring and summer, but on the more northern part of the coast it may occur in winter also.

Young animals are far more susceptible than adults, and it has been proved that a single tick is sufficient to set up the disease. Animals indigenous to the country appear to be immune, and it appears to be probable that wild animals possess a complete hereditary immunity.

The symptoms are as follows :—Dullness and loss of appetite with occasional vomition. Slight incoordination of the hind limbs which steadily advances to complete paralysis affecting all the limbs. There may be occasional convulsions. Vomition of bile-stained mucus occurs. Pulse and temperature are normal, but respiration is of the Cheyne-Stokes type. In fatal cases coma and death follow.

The paralysis appears to be purely motor. Early removal of the tick or ticks is important, as it has been proved by experiment that if the tick is removed soon after it has attached itself symptoms are not developed.

PAVLOVSKY (E. N.).

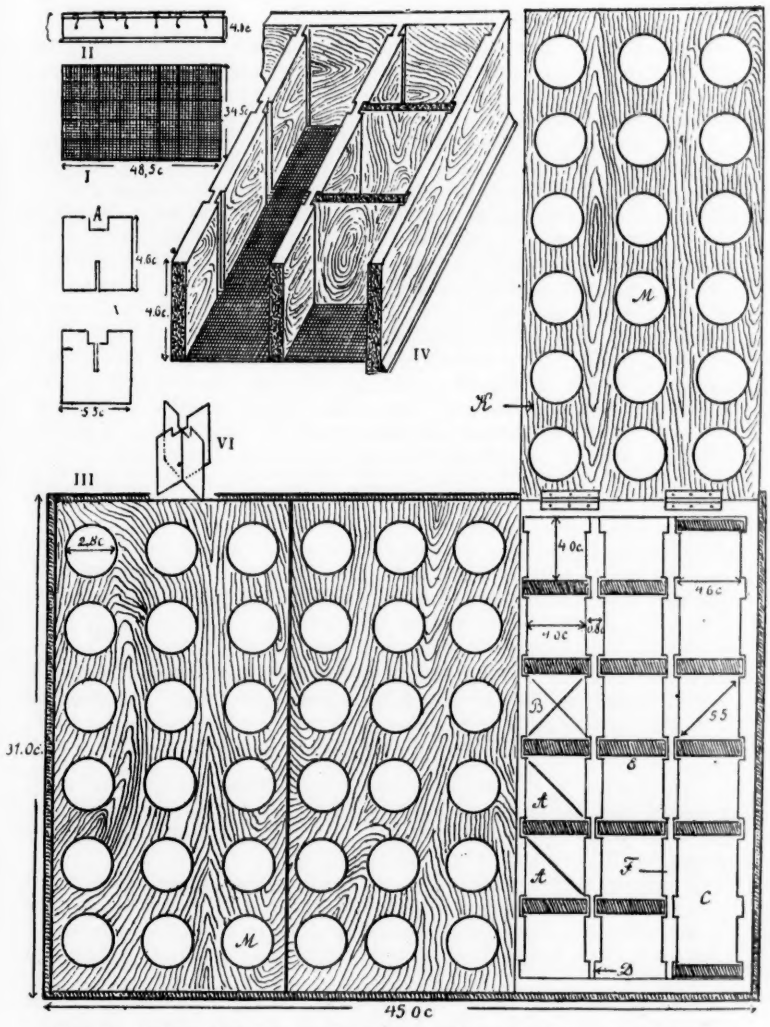

Fig. I. Bottom of original model, showing wire-gauze floor and partitions.

Fig. II. Lateral view of improved model showing hooks for fastening lid sections.

Fig. III. Plan of improved model showing lid sections, one of which is open: *A* and *B*, compartments subdivided into two or four parts respectively by the insertion of diagonal plates; *C*, double compartment formed by removal of one movable partition; *D*, space mortice; *E*, movable partitions; *M*, aperture of a compartment.

Fig. IV. Detail of the interior in perspective. The lid is not represented. The wire-gauze floor and wooden fillet are clearly shown.

Fig. V. Tin plates for diagonal partitions of compartments: *A*, incision for reception of part of cork protruding beneath the lid of the box

Fig. VI. Pair of tin plates interlocked for fourfold subdivision of compartment.

(Reproduced by permission from *Parasitology*.)

Cases have been seen in foals, calves, cats and dogs, and it has been reported in young pigs. The author doubts whether the latter cases were really due to the tick.

The author reviews the literature dealing with Tick Paralysis as observed in Australia, and describes at some length a case reported by EATON in 1913 which occurred in a child 4½ years old, and one recorded by STRICKLAND in 1915.

Other means having failed, the author finally succeeded in obtaining specimens of the ticks by encouraging his own dog to run through bush known to harbour them and carefully searching him immediately afterwards. In this way some thirty unengorged ticks were obtained, but from one cause or another all died before they attached themselves to experimental animals with the exception of three females and one male. The results obtained with these were, however, conclusive. One was placed on a guinea-pig and death ensued on the sixth day. One was placed on a full-grown Pomeranian dog, and death took place on the ninth day. One refused to attach itself to a lamb, but attached itself to a dog when placed on it. In this case the tick dropped off on the seventh day and was lost. No symptoms developed. The last one refused to bite on a sheep and also on a dog, and it died the following day. This experiment was not satisfactory in that (1) the tick may not have been virulent, (2) the dog was a stray street dog and may have been immune either from age or from previous intoxication.

The author discusses the possible ways in which the tick may produce the symptoms described, and comes to the conclusion that although a toxin manufactured by the tick itself may possibly be the real cause, further investigation is required.

ANDREWS (W. H.). **The So-called "Staggers" or "Pushing Disease" of Cattle in Natal. An Intoxication due to the Ingestion of *Matricaria nigellaefolia*, D.C.**— *Jl. Comp. Path. & Therap.* 1921. Dec. Vol. 34. No. 4. pp. 263–309.

This disease, which has been recognized for many years, has until recently been looked upon as of minor importance. In 1919, however, the author personally investigated or had accurate information regarding 570 cases, of which 450 ended fatally.

A common feature of all farms upon which the disease has occurred is the presence of swamp grazing. The annual incidence of the disease is variable. In some cases a varying number of cases occurred in successive years, while in others there have been long intervals between outbreaks.

The majority of outbreaks occur in the spring soon after the burning of the veldt. The influence of meteorological conditions upon the incidence of the disease is not known, but the majority of outbreaks investigated by the author occurred under conditions of drought.

The disease appears to attack cattle only. Breed does not appear to affect its incidence. Calves have not been affected before they start grazing, and the heaviest losses occur among milch cows.

The symptoms vary in different outbreaks and individual cases. One of the earliest symptoms is a change in the eye. This protrudes, and has a glazed appearance, while the pupil is contracted. Loss of appetite, grinding of the teeth and quivering of the ears are early symptoms.

These are associated with an aimless wandering with the head held low, uncertain gait, stumbling over small obstacles and difficulty in drinking.

In the second stage the affected animal shows a peculiar tendency to push its head against any obstacle, such as a tree, post, etc., either without great force or with extreme violence. After a time there is gradual relaxation of the muscles and the animal moves away or may fall exhausted.

During this stage there may be great violence or progressive coma.

During the last stage, which may be prolonged, coma is the most marked symptom, but there may still be phases of violent movement.

Recoveries have been recorded in cases where the symptoms have not been very pronounced, but no animal having reached the stage of convulsions is known to have recovered. The course of the disease may be anything from a few days to two months, but as a rule animals are killed as hopeless a fortnight to three weeks after the onset of illness.

The almost constant lesions are:—Emaciation, petechiae and ecchymoses on the heart, a flabby condition of the heart, subcapsular haemorrhages of the liver, and venous congestion.

The mortality is rather less than 80 per cent. as far as can be ascertained from the figures available, but the mortality varies greatly from outbreak to outbreak and farm to farm.

Recovery is a very slow process and animals which have passed through an attack, it may be some years previously, are liable to become excited on very little provocation.

There is not sufficient evidence upon which to base any opinion with regard to immunity.

The second part of the paper contains a detailed account of the investigations which the author carried out with a view to determining the cause of the disease, and the manner in which *Matricaria nigellaefolia* was incriminated.

The plant thrives best in mud which is in the process of drying up, and on ploughed land when there is sufficient moisture. It is an early and energetic colonist of damp bare places.

Experiments showed that there is a period of latency after ingestion of the plant comparable to the period of incubation of a bacterial disease. The limits of this period were (1) from 23 to 47 days after the commencement of matricaria feeding, and (2) 7 to 42 days after its suspension.

Only a few preliminary experiments have been made with a view to isolation of the active principle, but there appears to be a possibility that it is an essential oil.

STOICESCO (G.). **La Méningite cérébro-spinale enzootique du cheval en Roumanie.** [Enzootic Cerebro-spinal Meningitis of the Horse in Roumania.]—*Archiva Veterinaria*, 1921. Vol. 15. No. 6. pp. 229–236.

The disease was first observed in 1918 when an outbreak occurred in a stud in Botochani, when 45 out of 100 horses had it and 40 died within a period of two months. Bacteriological examinations yielded negative results.

In June, 1921, the disease again came under observation among a number of horses and mares (with some foals) at grass. The area upon which the animals were grazing was a hillside terminating in a

marsh which was partly dried up but full of reeds. Apart from this the grass was good. The first mare died after a few hours' illness with symptoms of colic on July 14. Four days later another mare died after showing symptoms suggestive of madness for three hours. During the following few days two more mares died.

On July 25 it was decided to move the animals to some empty stables near the town. By mistake the batch of animals was taken to the barracks, but was isolated. Nevertheless the disease spread to the horses of the regiment.

Of the 73 animals at pasture, ten mares, one foal and two horses died. Five cases occurred among the 610 horses belonging to the regiment and of these three died. Half the fatal cases terminated within 12 hours, and the remainder between 24 hours and 4 days.

While equine cerebro-spinal meningitis appears to have been recognized elsewhere (United States, France, Saxony, etc.), it appears to have been confounded with anthrax and typhoid infections in Roumania. Two forms of the disease are known—the peracute and the acute.

In the peracute form the disease develops in three or four hours. Affected animals are restless, appear frightened, show rigors, snort, appear to be unable to see obstacles in their path, execute incoordinated movements, and sweat Then they calm down and even become somnolent. During this stage the muscular tremors and sweating continue. The temperature rises to 38° or more. After the period of somnolence hyperexcitability appears again. Incoordination and muscular tremors and spasms are more pronounced. These affect the muscles of the head and neck particularly, causing a rigid extension of the head. The membranes of the eye are congested and may show petechiae. The pupil is dilated and its reflex is very slow. The pulse is weak and its rate is about 40 per minute.

The periods of excitement and depression follow each other at short intervals and death takes place in 6–12 hours.

In the acute form the symptoms are similar, but the periods of excitement are shorter and those of stupor longer than in the peracute form.

In cases which recover, the periods of excitement become shorter and shorter and the periods of depression longer, and gradual recovery takes place.

In acute cases the symptoms are as follows :—loss of appetite, indications of colic, trembling of certain muscles, particularly those of the abdomen. The periods of excitement are less frequent than in peracute cases, and intervals of stupor lasting 10–15 hours may intervene. The mucous membrane of the eyes is congested and the eyes are half closed. Lachrymation is marked. Urine is evacuated with difficulty, and it has a stringy, oily consistence. In some cases it may be blood tinged, and incontinence of urine is sometimes seen.

After two or three days symptoms of pulmonary congestion make their appearance, and three or four days later death occurs.

At the post-mortem examination no lesions characteristic of the disease are discoverable. Gelatinous oedema of the connective tissues and ecchymoses of the mucous membranes are frequently found. If pneumonia has supervened the lesions will be present. Putrefaction is very rapid. The contents of the intestines are tinged with blood. The spleen is enlarged and shows evidence of small haemorrhages. Congestion of the brain and cord, dropsy of the lateral ventricles, congestion of the pineal and general oedema are the lesions found in

the central nervous system. The disease does not appear to be transmitted by direct contact, and the period of incubation varies from 5–14 days.

A Gram-negative diplococcus has been isolated from the central nervous system. This is easily cultivated outside the body. The addition of serum improves culture media for it. Broth is not rendered turbid. Glucose, laevulose, lactose, and dextrose are not fermented; maltose is.

Intraperitoneal inoculation of guinea-pigs produces non-fatal peritonitis, and intracranial inoculation of rabbits fails to produce any symptoms of meningitis.

The diplococcus is agglutinated by normal horse serum in a dilution of 1 in 10, and that of a recovered animal causes agglutination in 1 in 40 to 1 in 25.

Horses inoculated intravenously with 1–2 cc. of blood taken from a case immediately after death have failed to become infected.

DONATIEN (A.) & BOSSELUT (R.). **Encéphalite aigue contagieuse du boeuf.** [Contagious Bovine Encephalitis.]—*Rev. Gén. Méd. Vét.* 1922. Apr. 15. Vol. 31. No. 364. pp. 185–191.

In this paper the authors describe a contagious disease which made its appearance in a herd of cattle in Marengo during the period September 10 to November 5, 1921.

The clinical aspect of the disease was as follows:—Affected animals fell into a kind of stupor which in about half the cases was interrupted by periods of excitement.

All the affected animals were in poor condition. It was noted that a stringy saliva trickled from the lips and that the pupils of the eyes were dilated. Frequent, but generally unavailing, efforts were made to defaecate. At times a small quantity of faeces covered with mucus was evacuated. Urination on the other hand was frequent and abundant. There was no fever. Loss of condition was rapid and death took place on the second or third day as a rule. Out of a herd of 20, 10 became affected and 9 died.

At the post-mortem the rumen was found to be full and the intestines empty. There was no evidence of obstruction in the omasum. In two cases there was marked softening of the splenic pulp. The urine contained albumen but no sugar.

To the naked eye all the organs appeared healthy. This was confirmed histologically in the case of the liver, kidneys, and lymphatic glands.

Diagnosis.—The absence of motor paralysis and glycosuria excluded rabies. Aujeszky's disease was likewise excluded by the absence of pruritus. A complete change of diet was without effect.

The stupor, mydriasis, paralysis of the rumen, and rapid termination suggested some diseased condition of the medulla.

Microscopic and cultural investigations failed to reveal any organism.

Inoculations with urine, pericardial fluid, lymphatic glands, and salivary glands have yielded negative results.

Proof as to the virulence of the nerves, blood, and spleen pulp is not yet forthcoming, as second passages have not yet been obtained.

The brain, spinal cord, and retina are virulent. Two calves inoculated into the anterior chamber of the left eye died thirteen days later

with clear symptoms of encephalitis. Two rabbits inoculated intramuscularly with emulsion of the retina of the right eye of each of these calves were found paralysed on the fourteenth day and dead on the day following.

The virus retains its virulence in neutral glycerin for a fortnight if kept in the dark at 15° C. Desiccation does not destroy it under the same conditions in ten days.

A rabbit inoculated intramuscularly with a brain emulsion filtered through a Chamberland filter (Chamberland L.1 *bis*) died with typical symptoms on the sixteenth day.

An emulsion of the medulla of this rabbit injected intramuscularly into two others produced paralysis in thirteen days and death two days later. The virus is therefore filtrable.

Four passages through rabbits failed to modify the virus for the rabbit, but produced attenuation for the calf.

Passage through dogs exalts the virulence for that species, death taking place in the first passage at 21, in the second at 18, and in the third at 13 days.

All species used so far have proved to be susceptible to the virus, viz., calves, rabbits, dogs, sheep, monkeys and guinea-pigs. In all these at least two positive passages have been obtained. A donkey succumbed, with typical symptoms, to inoculation with calf virus, and rabbits inoculated from the donkey contracted the infection.

The virus is transmissible by practically all methods of inoculation.

A sheep inoculated subcutaneously failed to become infected (single experiment).

The period elapsing between inoculation and death varies with the species and with the quantity and source of the virus.

It is noted that the period is very variable in the guinea-pig (six days to two months).

The symptoms vary with individuals and the method of infection.

Intramuscular inoculation usually causes myelitis, followed by cranial symptoms and death. Subdural and intraocular inoculation cause symptoms of brain disturbance from the outset.

The symptoms generally seen in the different species are :—Abundant salivation, variable temperature terminating in high fever, Cheyne-Stokes respiration, and indications of medullary involvement, such as spasms, inco-ordination of movement, hyperaesthesia and paralysis.

The most constant feature of the disease experimentally produced is its extreme rapidity of development, which with very few exceptions does not exceed 24 hours. Another notable feature is the complete absence of paralysis in those exceptional cases which run a more prolonged course.

With regard to the lesions it is important to note the absence of sugar in the urine, while albuminuria is fairly constant.

The only clear lesions are to be found in connexion with the nerve tissues.

The membranes are very congested, the spinal fluid is abundant and slightly turbid. On centrifugation the sediment shows numerous lymphocytes, some mononuclears, and frequently red corpuscles. Punctiform haemorrhages are found throughout the nerve tissues, particularly in the mid-brain.

Histological examinations have revealed perivascular infiltrations with lymphocytes, chromatolysis, and vacuolization of the nerve cells, destruction of the neurons either by leucocytes or, in the nerve ganglia, by proliferation of the cells of the sheaths of the ganglion cells.

Intracellular bodies of an undetermined nature have been detected in various parts of the nervous system.

PHILLIPS (E. P.). **A Possible Cattle Food.—Seeds of** *Sesbania cinerascens*, **Welw., and** *S. mossambicensis*, **Klotz.**—*Jl. Dept. Agric. (South Africa)*. 1922. Apr. Vol. 4. No. 4. pp. 361–365. With 1 plate.

Of the 23 species of Sesbania known to occur in Africa six are found in South Africa. Two of these have been examined by the Imperial Institute in London, and the reports would appear to warrant further investigation as to their food value for cattle. Heavy crops of seeds have been obtained from trial crops. The genus belongs to the Leguminosae, the leaves are always pinnate, and the flowers mottled, striped, or pure yellow or blue.

Reports on the two species examined at the Imperial Institute are given in detail.

Pending experiments, no opinion can be expressed as to the actual feeding value, but judging from the analysis it appears that the seed might be used in place of peas, lentils and millet. A further point which can only be settled by investigation is the possible effect of minute traces of alkaloid.

HOESEN (H. W.). **Rat-Plague Indicators in Java.**—*Meded. Burg. Geneesk. Dienst Ned.-Indië.* Batavia. 1920. viii. pp. 2–89. [Reviewed in *Rev. App. Entomol.* 1922. Apr. Vol. 10. Series B. No. 4. p. 75.]

As a result of investigations carried out in Java, SWELLENGREBEL stated that a certain relation appeared to exist between an increase of fleas in a given district and the occurrence of rat plague there.

There are three "indirect" indicators of rat plague, viz., the flea-index, the percentage of rats carrying fleas, and the ratio of such rats to those carrying trypanosomes and being shorter than 150 mm. (*i.e.*, young animals not yet immune to trypanosomiasis). With an outbreak of rat plague the percentage of flea-carrying rats would increase as a result of concentration of fleas upon living rats, while that of trypanosome-carrying rats would remain constant, as the infection with *Trypanosoma lewisi* appears only after a week or two, and plague-infected rats would have died before that.

It does not appear to be possible in Java to decide solely from the indirect indicators whether there is an epidemic occurring or not, though it may be possible to diagnose rat plague on indirect lines by a method of grouping the figures obtained from the flea-index and the percentage of flea-carrying rats.

MOUQUET (A.). **Contractions musculaires cloniques chez l'éléphant.** [Clonic Muscular Spasms in the Elephant.]—*Rec. Méd. Vét.* 1922. Jan. 30. Vol. 98. No. 2. pp. 49–51.

The subject was a female elephant from Indo-China, about 21 years old. It was known to have shown slight muscular contractions at the time when it first came under observation at the age of two years, but no particular note of their occurrence was made. Change of food, occasioned by the war, produced a marked loss of condition, and simultaneously muscular spasms became pronounced. The abdominal muscles showed contractions numbering up to 60 per

minute. It seemed that the diaphragm as well as the abdominal muscles were concerned. Similar contractions were observed in the extensors of the radius. Improvement in the condition of the animal resulted from a more suitable diet. After an interval of several months it was impossible to avoid another change in the diet, and shortly afterwards spasms of the muscles of the lower part of the neck were observed.

With a return to a proper diet improvement again set in.

ÉLOIRE (A.). **La Tuberculine diluée se conserve-t-elle longtemps?** [Does Dilute Tuberculin retain its Properties for Long Periods?] —*Rec. Méd. Vét.* 1922. Apr. 15. Vol. 98. No. 7. p. 200.

The author always uses dilute tuberculin for tests, by all methods. Dilute tuberculin in bottles with rubber stoppers which he had in his possession in 1914 was brought into use again in 1919, and was still giving satisfactory reactions seven years after it was originally obtained. In the interval the bottles had been kept in cold storage wrapped in red paper.

[Details of tests are not given.]

MUNDY (H. G.) & BLACKSHAW (G. N.). **Grasses of Agricultural Importance in Southern Rhodesia.**—*Rhodesia Agric. Jl.* 1922. Apr. Vol. 19. No. 2. pp. 134–149. With 12 plates.

VELU. **Note sur les lésions dentaires observeés sur les Mammifères de la Haute Chanoia.** [Dental Lesions of Mammals observed in Haute Chanoia (Morocco).]—*Maroc Médical.* 1922. Jan. 15. No. 3. p. 107.

REPORTS.

SOUTHERN RHODESIA. **Report of the Chief Veterinary Surgeon for the Year 1921. (With Report of the Veterinary Bacteriologist.)** [SINCLAIR (J. M.), Chief Vet. Surgeon, & BEVAN (Ll. E. W.), Govt. Vet. Bacteriol.]—10 pp. 1922. Salisbury, Rhodesia: Printed by the Government Printer.

African Coast Fever.—The Chief Veterinary Surgeon reports that the state of affairs is more satisfactory than at any time since the importation of the disease in 1901, but he does not think that complete eradication is in sight. His reason is that over and over again recrudescences have occurred in inexplicable manners in unsuspected districts. Emphasis is laid upon the necessity of maintaining the present regulations with the greatest stringency and of early detection of the disease. An increase of 240 in the number of dipping tanks is reported, bringing the total up to over 2,000. Inspectors are now provided with the apparatus necessary for checking the composition and strength of the dips used.

Contagious Abortion.—This disease was detected in 94 herds—an increase of 58, but this is not believed to represent the prevalence of the disease, as it is certain that many infected herds have not been reported. Detection of individuals and isolation are impracticable, and for the present vaccination and general prophylactic measures must be relied upon.

Quarter Evil.—This occurs in all districts and at all times of the year, but mainly during the winter. The mortality was 3,142. "All vaccines have been discarded in favour of aggressin and Leclainche-Vallee's liquid preparation, both of which have given most satisfactory results."

Swine Fever.—An outbreak occurred in the Lomagundi district; 29 animals died and the remainder were killed.

Report of the Veterinary Bacteriologist.

Contagious Abortion.—Outbreaks have occurred which apparently originated with the introduction of a new bull into the herd. Two hundred and two bulls have been tested, and of these 9·4 per cent. gave positive reactions to the agglutination test. The devitalized vaccine has proved to be valuable and its continued use is justified. Attention has been forcibly drawn to the danger of expecting the disease to "wear itself out." In Rhodesia the "disease assumes a chronic form in a herd, and although abortions are rarely detected, the low calf crop and the large number of sterile cows indicates its presence."

Attention is drawn to the possibility of human beings becoming infected from cattle suffering from contagious abortion.

Horse Sickness.—Of 110 horses subjected to protective inoculation six died, a smaller percentage than in the two preceding years. Approximately the same percentage of horses belonging to the British South Africa Police died of horse sickness during the year.

Egypt. **Ministry of Agriculture. Veterinary Service. Annual Report for the Year 1920–21** [Littlewood (W.), Director.] —pp. 73 + v. 1922. Cairo: Govt. Press. [Price P.T. 5.]

This report is divided into five sections dealing respectively with (1) Disease of Animals, (2) Veterinary Pathological Laboratory, (3) Provincial Inspectorates and Quarantines, (4) School of Veterinary Medicine, (5) Serum Institute.

1. During the year 41,676 animals were doubly inoculated against rinderpest, with 47 deaths. Ten animals which had been protected by double inoculation in 1912 were tested with 5 cc. of proved virulent blood. None reacted.

The value of the method for the inoculation of calves is under examination.

Eighty-three cases of rabies occurred during the year.

Glanders was detected in 51 cases, as against 106 the previous year.

Epizootic lymphangitis, anthrax and sheep-pox all showed reductions in numbers as compared with the previous year.

Trypanosomiasis of camels, piroplasmosis and tuberculosis all showed increases.

Section 2.—Although buffaloes may show clinical symptoms of piroplasmosis, and their blood may exhibit the changes associated with that type of infection, as yet parasites have not been discovered. The buffalo enjoys a remarkable freedom from ticks as compared with cattle.

Egyptian fever was first detected in a buffalo in April, 1920. This is not a piroplasmosis but a theileriasis.

East Coast fever has not been detected in Egyptian cattle, but in Sudanese cattle in quarantine. Although systematic collection and

examination of ticks has been carried on for years *Rhipicephalus simus* and *R. bursa*, which BRUMPT states carry the infection in Egypt, have not been discovered.

Reference is made to an eruptive condition in horses and donkeys, which is said to be caused by *Aphis leguminosa*. This insect attacks forage crops [bersîm and helba (clovers)], and was observed to attack farm animals.

In the case of a donkey there was loss of hair and skin on the neck and back. The eyes were inflamed. The legs, mouth and testes swollen. The insects were found upon it.

When stabled animals were fed upon infected clover, inflammation of the mouth occurred.

Filariasis of camels has been reinvestigated, and the conclusion arrived at is that the parasite is distinct from *F. evansi* of the Indian camel. The lesions also are quite different. A separate communication on the subject is promised.

Texas Fever. With the object of reducing losses from Texas fever, caused by the virulent blood used for the simultaneous inoculation against rinderpest, all cattle doubly inoculated in non-infected districts have been given 1 gm. of arrhenal subcutaneously on the fifth (or sixth) day after inoculation. In cattle plague infected areas arrhenal was used when it seemed indicated. The results of one year's investigation are available, but as the year was particularly good from the point of view of Texas fever the results are considered as inconclusive.

The number of animals in infected areas treated with arrhenal was 51,137, and 20 deaths from Texas fever were recorded. In non-infected areas 5,806 animals had the double inoculation followed by arrhenal on the fifth day. Four deaths from Texas fever were recorded.

BENGAL. **Annual Report of the Bengal Veterinary College and of the Civil Veterinary Department for the Year 1920–21.** [KERR (P. J.), Superintendent Civil Vet. Dept.]—pp. 4 + ii + 7 + ix + 2. 1921. Calcutta: Bengal: Secretariat Book Depot. [Price 15 annas.]

CEYLON. **Report of the Government Veterinary Surgeon for 1921.**

UNITED PROVINCES. **Annual Report on the Civil Veterinary Department for the Year ending March 31, 1921.** [HICKEY (S. G. M.), M.R.C.V.S.]—22 pp. 1922. Allahabad: Government Press. [Price R. 1–2.]

REVIEWS.

DOUWES (J. B.). **Bijdrage tot de kennis van enkele darmprotozoen der huisdieren in het bijzonder bij schaap en varken.** [Contribution to the Knowledge of Several Intestinal Protozoa of Domestic Animals, especially those in Sheep and Pigs.] Proefschrift. Utrecht. 1921. 8°. pp. 62 + 4 plates. (Electrische Boek- en Handelsdrukkerij " Frieda.")

This work is a dissertation submitted for the degree of Doctor of Veterinary Medicine at the Veterinary College in Utrecht, Holland. Like most works of a similar character, it contains a certain number of original observations scattered through much discursive matter.

The work is divided into five chapters, dealing respectively with the Protozoa in general, technique, parasitic flagellates and ciliates, amoebae, and coccidia. Of the first two nothing further need be said. In Chapter III, *Trichomonas*, *Giardia*, and *Balantidium coli* are discussed, but the

only noteworthy point is the author's statement that he has found *Balantidium coli* in the pigs in Holland, though not constantly—only occasionally in older animals, and never in young ones.

In Chapter IV the author discusses a number of amoebae. He himself found coprozoic forms ("*Amoeba* or *Vahlkampfia limax*") in the faeces of pigs, sheep, oxen, and horses, and cultivated some of them. [It is impossible to identify any of these from the descriptions.] He also found a parasitic amoeba in pigs—evidently *Entamoeba suis* Hartmann. He gives a detailed account of this organism and its cysts, and describes and figures a specimen of the latter containing four nuclei. [He says he has seen "several" similar specimens, but does not state how many pigs he examined. This amoeba is common in English pigs, and its cysts are almost invariably uninucleate.]

The last chapter is the longest, and deals with the Coccidia in some detail The author's own observations relate to species which he has found in sheep and pigs. In the faeces of a pair of healthy Asia Minor sheep he found the oocysts of a species which he identified as *Eimeria faurei* Moussu & Marotel. The development of the spores was studied, and is described and figured. Two lambs were fed on ripe spores. One of these acquired a heavy infection, with enteritis and severe diarrhoea, followed by death on the fifth day; the other showed an infection on the sixth day, but in spite of further feeding on ripe spores it remained healthy—though infected—for ten days thereafter, and was then killed. Its large intestine contained oocysts, and showed no pathological changes. In the walls of the small intestine, however, though this part of the gut appeared only slightly reddened, numerous schizogonic and sexual stages in the development of the *Eimeria* were found. These are described and figured, discussed in some detail, and compared with similar stages recorded by other observers.

Examination of the faeces of pigs revealed the presence of coccidia in these animals also. Young pigs, 3–10 weeks old, were invariably found infected (12 pairs, presumably from different litters, were examined), though old pigs (number not stated) were always uninfected—even the sows suckling the infected young invariably giving negative results. The coccidia appeared to belong to two different species of *Eimeria*—one common, with a small oocyst, the other much rarer, with an oocyst 50μ by 35μ. Both species are described and figured, the smaller in some detail. Its schizogonic stages were not found, but a few sexual forms were observed in scrapings from the mucous membrane of the small intestine. The oocysts are ovoid, and measure 17–22μ by 14–19μ. (These dimensions are given in the summary on p. 57. On p. 54 they are variously given as 14μ by 18μ and 18–24μ by 15–20μ.) The spores have a blunt oval shape, but are stated to measure 18 [?]–14μ by 6–8μ. The author proposes to name this parasite "*Eimeria de Bliecki*": to the larger species he assigns no name. [This name—more properly written *E. debliecki*—appears to be valid. It has priority over the name *E. brumpti* proposed later in the same year, for apparently the same organism, by Cauchemez (*Bull. Soc. Path. Exot.*, xiv, 645. 1921).]

It is manifest that the author of this thesis is not deeply versed in protozoology. He often ignores the rules of zoological nomenclature, frequently writes the names of animals and persons incorrectly, and not seldom appears to have misinterpreted the writings of others. Typographical errors abound in his pages, and he does not seem yet to realize that bibliography is a matter to be taken seriously, and that references which are but rough approximations will not do. (Of the 72 references given, many are incorrect, and not one is accompanied by adequate bibliographic data.) The illustrations are poor. All these defects, however, are obviously due to inexperience; and instead of emphasizing the very evident shortcomings in this work, the reviewer has therefore taken the more profitable course of noting the author's real additions to the subject—additions which are by no means always patent in the original.

Clifford Dobell.

Hunting's Art of Horse-Shoeing. 4th Edition, Revised and Edited by A. B. MATTINSON [O.B.E., M.C., F.R.C.V.S., D.V.S.M., etc.]. —pp. viii + 223. With 169 figures. 1922. London: Baillière Tindall & Cox. [Price 10*s.* 6*d.* net.]

Hunting's "Art of Horse-shoeing" was originally written for three classes of readers: for horse owners having an interest in the subject, for farriers who are open to conviction, and for veterinary students who have to be examined on the shoeing of horses. The greater part of practical farriery was carefully described by a very acute observer—the late William Hunting. He held strong views on horse shoeing, and he had sufficient courage to express them more or less emphatically and sometimes dogmatically according to his estimate of the immediate importance of the section under discussion. On many points he did not agree with the accepted teaching, but he always gave excellent reasons for differing from the recognized authorities on the subject. He had given more attention than most veterinary surgeons to the practice of shoeing and his first little book was based on long, earnest observation of good and bad shoeing of horses in London. His work has stood the test of time and it merits permanence as a clear, crisp and reliable guide to the best methods of shoeing horses. The first edition was highly appreciated by veterinary surgeons and by farriers who were willing to improve their knowledge of the subject. This issue was followed at short intervals by a second and a third, and now, owing to the sustained popularity of Hunting's instructions, a fourth edition, revised and edited by Major Mattinson, has been produced. It is more comprehensive than any of its forerunners, and although the additions may not be considered as of first-rate importance they were required to complete the work as a text-book. The editor has succeeded in producing a trustworthy book on a subject which still claims much attention from those engaged with horses. It is fully illustrated and very well printed on excellent paper. Altogether it may be regarded as the most direct exposition in English of the art of shoeing horses.

J. Macqueen.

BRITISH MUSEUM 6 SEP 22